VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a major, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260 et seq. The discharge results from the operation of a municipal wastewater treatment facility. This permit action includes authorization of an increase in facility design flow, revised effluent limitations, and revised special conditions.

1. Facility Name and Address: Falling Creek WWTP
2100 Station Road
Richmond, VA 23237

SIC Code: 4952 - Sewerage Systems

2. Permit No. VA0024996 Permit Expiration Date: June 12, 2013

3. Owner: Chesterfield County
Owner Contact: Scott Morris
Title: Assistant Plant Manager
Telephone No.: (804) 717-6087
Owner Address: P.O. Box 608
Chesterfield, VA 23832

4. Application Complete Date: November 28, 2012
Permit Drafted By: Bradford Ricks Date: 3/8/2013
DEQ Regional Office: Piedmont Regional Office
Reviewed By: Emilee Adamson Date: 3/22/2013
Curt Linderman Date: 4/19/2013
Kyle Winter Date: 4/22/2013
Public Comment Period Dates: July 3, 2013 to August 2, 2013

5. Receiving Stream:

	Outfall 001	Outfall 002	Outfall 003
Name:	James River	Grindall Creek	Grindall Creek
River Mile:	2-JMS103.11	2-GRK000.17	2-GRK000.17
Basin:	James River (Lower)	James River (Lower)	James River (Lower)
Subbasin:	N/A	N/A	N/A
Section:	1	1a	1a
Class:	II	III	III
Special Standards:	bb	None	None
1-Day, 10-Year Low Flow:	Tidal	0.018 MGD	0.018 MGD
7-Day, 10-Year Low Flow:	Tidal	0.021 MGD	0.021 MGD
30-Day, 5-Year Low Flow:	Tidal	0.064 MGD	0.064 MGD
30-Day, 10-Year Low Flow:	Tidal	0.031 MGD	0.031 MGD
Harmonic Mean Flow:	Tidal	0.17 MGD	0.17 MGD
Tidal?	Yes	No	No
On 303(d) list?	Yes	Yes	Yes

See Flow Frequency Determination in **Attachment A**. Although the river miles for Outfall 002 and 003 are slightly different from that which is presented in the 2008 fact sheet, this is only a change in accuracy as the physical outfall locations have not changed.

6. Operator License Requirements: The recommended attendance hours by a licensed operator and the minimum daily hours that the treatment works should be manned by operating staff are contained in the Sewage Collection and Treatment Regulations (SCAT) 9 VAC 25-790-300. A Class I licensed operator is required for this facility.

7. Reliability Class: Reliability is a measurement of the ability of a component or system to perform its designated function without failure or interruption of service. The reliability classification is based on the water quality and public health consequences of a component or system failure. The permittee is required to maintain Class I Reliability for this facility.

8. Permit Characterization:

(X) Existing Discharge
(X) Water Quality Limited
(X) POTW
(X) Whole Effluent Toxicity Program Required
(X) Reissuance
(X) Municipal
(X) Discharge to 303(d) Listed Segment

9. Wastewater Flow and Treatment:

Outfall Number	Wastewater Source	Treatment	Flow
001	Approx. 81,900 Chesterfield County and City of Richmond residents; 44 industrial contributors, including 2 SIUs	Screening, grit removal, equalization basin, primary clarification, biological treatment (aeration), secondary clarification, chlorination, dechlorination, step aeration	Design Flow: 12.0 MGD(2)
003	Flood pump station discharge (1)	Same as Outfall 001	Design Flow: 12.0 MGD Pump Capacity: 55 MGD
004	Calculated sum of Outfall 001 and Outfall 003 load limitations.	Same as Outfalls 001 and 003	Facility Design Flow 12.0 MGD

(1) Falling Creek WWTP, which is protected by a floodwall, is unable to discharge by gravity to the James River through Outfall 001 under flood conditions. Under flood conditions, the chlorinated overflow basin water, stormwater, and final effluent are diverted to a wet well and then pumped to Grindall Creek via Outfall 003. This outfall was not utilized for this purpose from January 2008 to the time of reissuance application preparation in September 2012.

The flood pumps are tested quarterly by running them for approximately 15 minutes; however, this is done only in accordance with the specific requirements specified in permit condition I.B.16 to prevent acute toxicity. Due to similar limiting factors in the 2008 permit, the pumps were only tested twice in 2012. The flood pumps have a total pumping capacity of 55 MGD dispersed over five pumps, of which only four can operate at one time. While the pumping capacity is 55 MGD, all permit limitations are based on 12.0 MGD, the permitted design capacity of the WWTP itself.

(2) The VPDES Permit Application received on November 28, 2012, identifies a design flow of 12.0 MGD, which is an increase from the design flow of 10.1 MGD provided in the 2008 permit reissuance. This design flow is considered a re-rating rather than an expansion. The permit application included a re-rate study dated October 16, 2012, modified March 14, 2013, signed and stamped by Taylor F. Turner, III, P.E. of Arcadis U.S., Inc. This study was reviewed and approved by Jimmy Desai with the wastewater engineering division of DEQ's Clean Water Financing and Assistance Program. To meet a design average flow of 12.0 MGD, the chlorine contact tank effluent weir will be raised approximately 1 ft 9 inches to provide sufficient chlorine contact time; however, a CTC/CTO is not required by SCAT Regulation (9 VAC 25-790) because this change will provide only a 16% increase in capacity. The flow increase is authorized by Part I.A of the 2013 permit reissuance.

Outfall 002: All influent enters the plant via the diurnal equalization basins which are provided to even out the incoming plant flow. During high flow events, screw lift pumps carry the overflow wastewater from the diurnal basins to the storm overflow basin. The total capacity of the diurnal basins and the storm overflow basin is 10 MG.

Under normal conditions, once the influent flows have decreased, the wastewater in the storm overflow basin drains back into the diurnal basins and then into the plant. However, under emergency operation conditions, when the basins are completely full and the screw pumps continue to pump, an overflow of untreated wastewater will flow to an overflow box where a chlorine feed system is automatically activated. The chlorinated overflow is discharged by gravity via Outfall 002 to Grindall Creek. From January 2011 to September 2012, Outfall 002 discharged on six occasions.

Non-stormwater discharges from this outfall are considered bypasses and are addressed as such in Part II of the permit. Outfall 002 is also the discharge point for the plant's stormwater collection system which is permitted under the VAR05 general VPDES permit for point source discharges of storm water associated with industrial activity; Permit No. VAR051258. For these reasons, Outfall 002 is not assessed for reasonable potential or given monitoring or limitation requirements in this permit.

See **Attachment B** for facility diagrams.

10. Sludge Disposal: Chesterfield County currently contracts through Nutri-Blend, Inc. to land-apply the sludge generated by the facility (Pollutant Concentration Sewage Sludge) under multiple BUR and VPA permits. The sludge meets Class B pathogen reduction.

11. Discharge Location Description: This facility discharges to the James River and Grindall Creek. Name of USGS topographic map: Drewry's Bluff (99B) (See **Attachment B**)

12. Material Storage: The POTW employs and stores a variety of chemicals in the treatment process; however, all are stored under roof or in sealed tanks, and with spill containment where appropriate. Some regularly utilized and stored chemicals include alum, methanol, calcium hydroxide, sodium hypochlorite, and sodium bisulfite.

13. Ambient Water Quality Information: Ambient water quality data from river mile 2-JMS104.16 (**Attachment C**) was used in this analysis for Outfall 001. This station is located at Buoy 166, approximately 1 mile upstream of the outfall on the James River. Ambient water quality data for Grindall Creek was not needed to develop effluent limitations for Outfall 003 as it discharges only under unusual flood conditions.

14. Antidegradation Review and Comments: Tier 1__X___ Tier 2_____ Tier 3_____
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect those uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with a Tier determination. The receiving stream, James River, is determined to be a Tier 1 waterbody. The Richmond-Crater Water Quality Management Plan allocates BOD and ammonia to multiple dischargers in the segment for the purpose of maintaining dissolved oxygen concentrations at or above the level of the standard. See TMDL discussion in item 26. Grindall Creek is determined to be a Tier 1 waterbody based on a previous determination when Outfall 001 discharged to Grindall Creek and on the existence of other

discharges to the creek where Water Quality Standards are expected to be maintained, at a minimum.

15. Site Inspection: September 13, 2012 by Heather Deihls and Meredith Williams. **Attachment D.**

16. Effluent Screening & Limitation Development:

Mixing Zone Analysis and Model

The permittee submitted a mixing model for the Falling Creek WWTP discharge to the James River (**Attachment E**) in February 1992 based on the previous plant flow of 10.1 MGD. This model was the basis of an acute mixing ratio of 6.67 total parts to 1 part effluent and a chronic mixing ratio of 30 total parts to 1 part effluent used in previous permit reissuances. The 2008 fact sheet discussion of how mixing ratios were derived from the mix study is also contained in **Attachment E**. With a revised design flow of 12.0 MGD proposed in the 2012 permit application, this model can no longer be applied as representative of current mixing conditions. Without additional information, mixing ratios revert to the default values recommended on page 30 of Guidance Manual GM00-2011 of 2:1 for acute toxicity and 50:1 for chronic toxicity. However, due to the significant relaxation of the chronic mixing ratio provided by these default values and in consideration of chronic toxicity observed in WET tests during the 2008 permit term, the 30:1 chronic mixing ratio is maintained as appropriately more conservative.

Reasonable Potential Evaluation

Limitation evaluation begins with a wasteload allocation analysis using MSTRANTI version 2b (a DEQ excel spreadsheet). Acute and chronic waste load allocations are calculated from criteria for surface water given in the VA Water Quality Standards (9VAC 25-260-140). Statistically derived permit limits are obtained by inputting these acute and chronic waste load allocations along with reported data or default data values of those constituents for which water quality standard based load allocations exist (see Table 1) into the DEQ statistical program STATS.exe. Monitoring frequencies input into STATS.exe are those which would be required if limited in the 2013 permit reissuance. Results of STATS.exe analyses are summarized in Table 2 below and detailed in **Attachment F**.

This reasonable potential analysis resulted in a limitation evaluation for the wastewater constituents identified in Tables 1 and 2 below. Also included in **Attachment F** are effluent data submitted on Discharge Monitoring Reports (DMRs) during the 2008 permit term, MSTRANTI printouts with WLAs, and the MSTRANTI data source report.

Table 1: Effluent Limitation Analyses

Parameter (Units)	Max Detected Value[1]	WLA_a	WLA_c
Ammonia (mg/L)	9.00[2]	26.6	30.2
Copper, dissolved (µg/L)	3.5	23	190
Lead, dissolved (µg/L)	0.19	200	240
Nickel, dissolved (µg/L)	1.8	320	430
Zinc, dissolved (µg/L)	35.1	210	2500
Chloride (mg/L)	51	1,700	6,900
Total Residual Chlorine (µg/L)	20,000[3]	38	330

[1] Data from permit application unless otherwise noted. Data detected below the Quantitation Level (QL) specified in the application was considered absent for the purpose of this evaluation.
[2] An ammonia default data value of 9.00 mg/L is used in place of effluent data for this statistical evaluation in accordance with Guidance Memo 00-2011. See additional ammonia discussion below.
[3] A TRC default value of 20,000 µg/L is used in place of effluent data for this statistical evaluation in accordance with DEQ Guidance Memo No. 00-2011.

Table 2: STATS.exe Limitation Analysis Summary

Parameter (Units)	Limit Needed?
Ammonia (mg/L)	No
Copper, dissolved (µg/L)	No
Lead, dissolved (µg/L)	No
Nickel, dissolved (µg/L)	No
Zinc, dissolved (µg/L)	No
Chloride (mg/L)	No
Total Residual Chlorine (µg/L)	Yes

Table 3: Human Health Criteria Comparison

Parameter (Units)	Max Detected Value[1]	WLA_{hh}	Limit Needed?
Chloroform (µg/L)	34	330,000	No
Nickel, dissolved (µg/L)	1.8	140,000	No
Zinc, dissolved (µg/L)	35.1	780,000	No

[1] From permit application.

Other parameters: Where dissolved metals were reported with the 2012 permit application for evaluation against dissolved metal water quality standards in accordance with the procedures outlined in GM 00-2011, total metals data provided with the permit application were not evaluated. Other parameters reported in the application as >QL but with no applicable water quality standards were not included in this reasonable potential analysis. All parameters reported as <QL are believed absent for the purposes of reasonable potential analysis and no limits or further monitoring are required by the 2013 permit. It is noted that the QL used for dissolved silver analysis provided with the permit application (0.5 µg/L) was greater than the requested QL (0.2 µg/L); however, with a site specific target value (SSTV) of 2.2 µg/L identified in the MSTRANTI printout included in **Attachment F**, it remains appropriate to consider silver absent. Assessment of conventional pollutants and nutrients is discussed below.

Outfall 003: With respect to evaluations for Outfall 003, normal reasonable potential analyses for pollutants of concern are not appropriate under flood conditions. Special Condition I.B.16 was included in the permit to specify the non-flood conditions under which the permittee can discharge from this outfall. Permit staff utilized Best Professional Judgment (BPJ) to develop this permit condition and believe such a condition is necessary to ensure that all systems are operational when flood conditions arise. **Attachment F** includes a Grindall Creek Flow Analysis, Mix.exe analysis, MSTRANTI spreadsheet, and MSTRANTI data source report used to assist with development of special condition I.B.16 and to verify that discharges from Outfall 003 under the effluent limitations placed on Outfall 001 will be protective of water quality. A BPJ review of this data concludes that discharges from Outfall 003 will be protective of water quality when managed in accordance with permit condition I.B.16.

Conventional Pollutants and Nutrients

The $cBOD_5$ and ammonia loading limitations are carried forward from the 2008 VPDES permit, based on the Richmond Crater Water Quality Management Plan (RCWQMP) specified in 9VAC25-720-60. The TSS load limitation is also carried forward from 2008 to maintain the facility's TSS permitted design load under the Chesapeake Bay TMDL and Watershed Implementation Plan (WIP). Although plant flows have increased since the effective date of Table B7 in this regulation,

the limitations therein must be maintained, thereby reducing concentration limits for $cBOD_5$, ammonia, and TSS accordingly. Revised concentration limits are obtained as through the following equation (example is Monthly Average $cBOD_5$, June – October):

1348 lbs/d / (8.3438 x 12.0 MGD) = 13.46 mg/L, rounded to 2 significant digits = 13 mg/L

Concentration limits for $cBOD_5$ and TSS are written with 2 significant figures because $cBOD_5$ cannot be reported to a decimal place and the TSS limitation is based on $cBOD_5$. The ammonia concentration limit is written with 3 significant figures to be reflective of the loading limitation which is also written in 3 significant figures. All applicable load limits in the RCWMP are written to the nearest whole number; therefore all load limits based on the RCWQMP are also written to the nearest whole number. With $cBOD_5$ and TSS concentration limits sufficiently below secondary treatment standards, the 85% removal clause otherwise required by 40 CFR 133.102 was excluded from Part I.A of this permit as 85% removal is expected to be met and verified by limitations more stringent than secondary.

Table 4: Effluent Limitation Development

PARAMETER		BASIS FOR LIMITS	DISCHARGE LIMITS					
			MONTHLY AVG		WEEKLY AVG		MIN	MAX
Flow (MGD)		NA	NL – monitoring only				NA	NL
pH (standard units)		1, 5	NA		NA		6.0 S.U.	9.0 S.U.
$cBOD_5$	June – October	3	13 mg/L	611 kg/d	20 mg/L	917 kg/d	NA	NA
	November – May	3	20 mg/L	917 kg/d	30 mg/L	1376 kg/d	NA	NA
Total Suspended Solids (TSS)	June – October	2	13 mg/L	611 kg/d	20 mg/L	917 kg/d	NA	NA
	November – May	2	20 mg/L	917 kg/d	30 mg/L	1376 kg/d	NA	NA
Ammonia as N	June – October	3	5.38 mg/L	244 kg/d	8.07 mg/L	367 kg/d	NA	NA
	November – May	3	12.8 mg/L	581 kg/d	19.2 mg/L	872 kg/d	NA	NA
Total Phosphorus (as P)		4	2.0 mg/L		NA		NA	NA
Total Nitrogen – Year-to-Date		4	NL		NA		NA	NA
Total Nitrogen – Calendar Year Average		4	5.8 mg/L		NA		NA	NA
Dissolved Oxygen (mg/L)		3	NA		NA		5.9 mg/L	NA
Total Residual Chlorine (TRC)		1	19 µg/L		23 µg/L		NA	NA
E.coli		1	126 N/100 mL (geometric mean)		NA		NA	NA

1. Virginia Water Quality Standards (9VAC25-260)
2. Chesapeake Bay TMDL – see Fact Sheet item 25
3. Richmond Crater Water Quality Management Plan
4. Nutrient Regulations and DEQ Related Guidance
5. Secondary Treatment Regulation: 40 CFR Part 133

Total Nitrogen: The numeric limitation for TN annual average concentration was carried forward from Part I.A.2 of the 2008 permit. See **Attachment G** for documents describing nutrient concentration limit development for the 2008 permit reissuance. Because this limitation was based on the capability of treatment technology installed and the nutrient removal technology has not been upgraded since its installation, the concentration limit is unchanged.

TN year-to-date and annual average concentration reporting requirements were included in the individual permit as these calculations are not performed or reported on the nutrient general permit DMR.

Total Phosphorus: The TP concentration limit is carried forward from the 2008 permit which maintained the limitation provided from the former Nutrient Enriched Waters (NEW) designation

of the receiving stream. **Attachment G** contains documentation which identifies the cause for maintaining this concentration limit rather than a nutrient load allocation based concentration limit in the 2008 permit.

17. Basis for Sludge Use & Disposal Requirements: The permittee generates sludge which is land applied through contractors operating under individual VPA permits applicable to each land application site. Parts I.A.2 and I.B.8 are included in the permit in accordance with GM 10-2003 Section MN-4. VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B 2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal. Because sludge land application is permitted separately through land application contractors, sludge use and disposal conditions specific to land application are not included in this permit.

18. Antibacksliding: The 2008 permit included a new dissolved oxygen (DO) limitation of 6.0. This was based on 9VAC25-260-185 of the Water Quality Standards, which establishes minimum DO concentrations of greater than 5 mg/L (instantaneous minimum) and greater than 6 mg/L (7-day mean) for migratory fish spawning and nursery, all applicable February 1 through May 31, while the open water DO WQS are applicable year round and require a 30-day mean greater than 5.5 mg/L, a 7-day mean greater than 4 mg/L, and an instantaneous minimum of greater than 4.3 mg/L. 6.0 mg/L was chosen as a BPJ interpretation to meet these narrative criteria with one consistent limitation. The Office of VPDES Permits subsequently determined that the application of a 6.0 mg/L limitation was a mistaken interpretation of this regulatory section titled, "Criteria to protect designated uses from the impacts of nutrients and suspended sediment in the Chesapeake Bay and its tidal tributaries". As indicated by the title, this section is considered to be managed through nutrient and sediment control, separately in place through the General Permit for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia (Nutrient GP) and the RCWQMP. GM00-2011 states that one of the exceptions to the antibacksliding regulation is when "technical mistakes or mistaken interpretations of law were made in issuing a permit containing BPJ limits." Consequently, the dissolved oxygen limitation is reduced to 5.9 mg/L in accordance with the RCWQMP for this reissuance.

19. Compliance Schedules: There are no compliance schedules included in this permit.

20. Special Conditions:

Part I.B.1: Additional Limitations and Monitoring Requirements
Rationale: Required by Sewage Collection and Treatment Regulations, 9VAC25-790 and Virginia Water Quality Standards 9 VAC 25-260-170, bacteria; other recreational waters. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This special condition ensures proper operation of chlorination equipment to maintain adequate disinfection.

The TRC minimum of 0.60 mg/L was established to demonstrate an adequate bacterial kill; the alternative language, which allows bacteria testing within 15 minutes of a TRC value <0.60 mg/L, gives the facility flexibility in demonstrating that a sufficient bacterial kill has occurred. Additionally, the agency and facility do not have to address any inconsequential violations of this limitation.

The continuation of this customized special condition language is carried forward from the 2008 permit due to the facility maintaining VEEP participation at the E3 level. This language is consistent with the testing requirements in Proctor's Creek WWTP VPDES Permit (VA0060194) as well as other metro Richmond major municipal facilities.

Part I.B.2: 95% Capacity Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 4 for all POTW and PVOTW permits.

Part I.B.3: Operation and Maintenance Manual Requirement
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Control and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

Part I.B.4: Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C and the Code of Virginia § 54.1-2300 et seq., Rules and Regulations for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals (18 VAC 160-20-10 et seq.), require licensure of operators.

Part I.B.5: Reliability Class
Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

Part I.B.6: Sludge Use and Disposal
Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P, 220 B 2, and 420 through 720; and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

Part I.B.7: Sludge Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C for all permits issued to treatment works treating domestic sewage.

Part I.B.8: Special Conditions for Land Application of Sewage Sludge
Rationale: VPDES Permit Regulation, Part VI-Subpart B.

Part I.B.9: Compliance Reporting
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limitation or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

Part I.B.10: Materials Handling/Storage
Rationale: 9 VAC 25-31-50 A prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia §62.1-44.16 and 62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

Part I.B.11: Reopeners
Rationale:
a. Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed it they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act.
b. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.
c. 9 VAC 25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

Part I.B.12: Indirect Dischargers
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 1 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

Part I.B.13: CTC and CTO Requirement

Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790. 9 VAC 25-40-70.A authorizes DEQ to include technology-based annual concentration limitations in the permits of facilities that have installed nutrient control technology, whether by new construction, expansion, or upgrade.

Part I.B.14: Nutrient Reporting Calculations
Rationale: §62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this definition is carried forward in 9 VAC 25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, this special condition is intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

Part I.B.15: Suspension of Annual Average Concentration Limits for E3/E4 Facilities
Rationale: 9 VAC 25-40-70 B authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

Part I.B.16: Exercising Outfall 003 Flood Pumps
Rationale: BPJ – the permittee has requested that they be allowed to exercise the flood pumps and discharge from Outfall 003 during non-flooding conditions in addition to discharging during flood conditions which prevent the use of Outfall 001. This condition was written to allow the facility to exercise the flood pumps in a manner that will prevent toxic conditions from occurring in Grindall Creek.

Part I.B.17: Effluent Monitoring Frequencies
Rationale: Permittees are granted a reduction in monitoring frequency based on a history of permit compliance. To remain eligible for the reduction, the permittee should not have violations related to the effluent limits for which reduced frequencies were granted. If permittees fail to maintain the previous level of performance, the baseline monitoring frequencies should be reinstated for those parameters that were previously granted a monitoring frequency reduction.

Part I.B.18. Closure Plan
Rationale: Code of Virginia § 62.1-44.19 of the State Water Control Law. This condition establishes the requirement to submit a closure plan for the wastewater treatment facility if the treatment facility is being replaced or is expected to close.

Part I.C: Pretreatment Program
Rationale: VPDES Permit Regulation, 9 VAC 25-31-730 through 900, and 40 CFR part 403 require certain existing and new sources of pollution to meet specified regulations.

Part I.D: Whole Effluent Toxicity (WET) Monitoring Program
Rationale: VPDES Permit Regulation, 9 VAC 25-31-210 and 220 I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. See **Attachment J** for the WET evaluation.

Part II, Conditions Applicable to All VPDES Permits
Rationale: The VPDES Permit Regulation at 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

21. Changes to 2008 Permit:
Cover Page: Authorization to discharge from Outfall 002 has been removed from this permit. Authorization do discharge from Outfall 002 is provided through VAR05 general VPDES permit for

point source discharges of storm water associated with industrial activity; Permit No. VAR051258. All other discharges from Outfall 002 are considered bypasses, to be addressed in accordance with Part II of the Permit.

Part I.A Changes:
2008 Part I.A.1 has been removed following installation of nutrient removal technology. 2008 Part I.A.2 has been removed and replaced with 2013 Parts I.A.1, I.A.2, and I.A.3 due to an increase in design flows from 10.1 MGD to 12.0 MGD authorized by the 2013 permit and to differentiate data reporting for Outfall 001 and Outfall 003.

2008 Part I.A.3 moved to Part I.A.4 of the 2013 permit and language was revised to match current GM10-2003 boilerplate.

Other Changes to Part I		
From	To	Change and Rationale
I.B.1, I.B.2	I.B.1	Additional Limitations and Monitoring Requirements: Revised in accordance with current VPDES Permit Manual guidance (GM10-2003). The *E.coli* reference in I.B.1.c was changed from 235 N/100 mL to 126 N/100 mL to reflect changes in the WQS regulations.
I.C.1	I.B.2	95% Capacity Reopener: Minor revisions to reflect current VPDES Permit Manual guidance (GM10-2003).
I.C.2	I.B.3	Operation and Maintenance Manual Requirement: Reflects statewide changes in boilerplate language provided email from DEQ Central Office dated 4/3/2012.
I.C.3	I.B.4	Licensed Operator Requirement: Renumbered, no substantial change.
I.F, I.G	I.B.8	Special Conditions for Land Application of Sewage Sludge: Renumbered and internal references to other permit conditions revised to match 2013 permit. Condition now incorporates reporting requirements for land application of sewage sludge, located in Part I.G of the 2008 permit.
I.C.7	I.B.9	Compliance Reporting: Renumbered and text revised in accordance with current VPDES Permit Manual guidance (GM10-2003). The $cBOD_5$ QL was adjusted from 5.0 mg/L to 2 mg/L for consistency with recently adopted VPDES General Permit regulations. Part I.B.9.e was maintained to address nutrient reporting requirements.
I.C.8	I.B.10	Materials Handling/Storage: Minor revision to reflect current VPDES Permit Manual guidance (GM10-2003).
I.C.11	I.B.13	CTC and CTO Requirement: Significant revisions reflect changes in current VPDES Permit Manual guidance (GM10-2003).
I.C.14	I.B.16	Outfall 003 Discharge Conditions: Special condition modified to clarify conditions under which flood pumps may be exercised and to specify that other discharges are only to occur when Outfall 001 cannot be utilized due to flood conditions.
I.C.15	I.B.17	Effluent Monitoring Frequencies: Parameters and frequencies modified to reflect reduced monitoring in the 2013 permit and increased frequencies due to flow increase to 12.0 MGD.
I.C.16	--	Condition deleted as it is no longer applicable to this facility.
--	I.B.18	Closure Plan: Added in accordance with current VPDES Permit Manual guidance (GM10-2003). Additional language included to require implementation of approved plan and notice of plan completion.
I.D	I.C	Pretreatment Program: Renumbered with revised language to reflect current guidance and regional protocol. Applicable to facilities with an approved pretreatment program.
I.E	I.D	Whole Effluent Toxicity (WET) Monitoring Program: Renumbered, language revised to match current Central Office boilerplate while maintain only chronic monitoring requirements, and annual reporting requirement due dates revised. 5th Annual report removed as it will not fit in permit term with calendar year monitoring frequency.
2008 Parts I.C.4, 5, 6, 9, 10, 12, and 13 were titled and renumbered to 2013 Parts I.B.5, 6, 7, 11, 12, 14, and 15 without any other change.		
Changes to Part II		
--	II.A.4	Monitoring requirement incorporated to reflect change in laboratory accreditation requirements.

22. Variances/Alternate Limits or Conditions: None.

23. Public Notice Information required by 9 VAC 25-31-280 B:

All pertinent information is on file and may be inspected or copied by contacting Bradford Ricks at:

Piedmont Regional Office
4949-A Cox Rd
Glen Allen, VA 23060
(804) 527-5129
Bradford.Ricks@deq.virginia.gov

DEQ accepts comments and requests for public hearing by hand delivery, e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit. The public may review the draft permit and application at the DEQ office named above by appointment or may request copies of the documents from the contact person listed above.

24. Additional Comments:

Previous Board Action: None.

Fees – Annual maintenance fees were last paid on September 13, 2012 and are up to date.

EPA Comments: Following review of the draft permit, EPA provided the following response on June 28, 2013: "EPA exercised its discretion in the review of this State-submitted draft permit and has chosen to perform a limited review on the TMDL requirements. As a result of this limited review, we have no comments related to the TMDL requirements."

VDH comments: Following review of the permit application, VDH stated, "There are no public water supply intakes within 15 miles downstream of the discharge/activity. The Falling Creek STW outfall is located approximately 26.3 miles upstream of the raw water intake for the Virginia-American Hopewell WTP, which is located on the Appomattox River, near its confluence with the James River.

Planning conformance statement: The discharge is in conformance with the existing planning documents for the area.

eDMR Participation: This facility is an eDMR Participant since 9/17/2010.

Virginia Environmental Excellence Program (VEEP) participation: This facility is enrolled in VEEP at the E3 level. Permit condition I.B.15 is included in this permit as a result.

Controversial Project/permit? This permit is not expected to be controversial.

Owner Comment: A summary of owner comments and DEQ responses to all comments received is provided in **Attachment I**.

Public Comment: Public notice was published in Style Weekly on July 3 and July 10, 2013. A copy of the public notice was also mailed to County Administrator Stegmaier, Board of

Supervisors chairman Jaeckle, the Crater Planning District Commission, and the Richmond Regional Planning District Commission. No comments were received.

Staff Comments:

- Because of the proposed increase in flow from 10.1 MGD to 12.0 MGD, notification of application receipt to local government and riparian landowners was required in accordance with Section 62.1-44.15:4.D of the State Water Control Law. As allowed by GM11-2005, "revised Local Government, Riparian Property Owner, Adjacent Property Owner or Resident, and General Public Notification Procedures for VPDES, VPA and VWP Permit Applications and Draft Permits", identification of riparian land owner information was obtained from the County's online Geographic Information System on March 7, 2013, with notifications mailed to all riparian owners 0.25 miles upstream and downstream of the Outfall 001 discharge to the James River, and to all riparian owners from the Outfall 003 discharge to Grindall Creek to its confluence with the James River.

- As presented in the DMR Data evaluation in **Attachment F**, performance-based monitoring reduction was reevaluated with this permit reissuance. Given the facility's performance and VEEP participation at the E3 level, ammonia and $cBOD_5$ continue to qualify for reduced monitoring frequencies. DO no longer qualifies for reduced monitoring due to current DEQ policy specified in GM10-2003 that facilities using active or forced post aeration cannot qualify for reduced DO monitoring frequencies. TSS is currently limited at a reduced monitoring frequency of 1 per month as allowed by the GM10-2003 Sampling Schedule Table (Section MN-2, page 2); therefore, further reduction is not appropriate. E. coli does not qualify for reduced monitoring as a result of changes to the chlorine contact tank as GM10-2003 states, "…upgraded treatment facilities should generate three years of data before being eligible for consideration for reduced monitoring."

  Although regional protocol does not typically apply reduced frequencies to parameters with seasonal tiers, or which have upgraded within three years, an allowance is being made in this case because the facility is a VEEP participant at the E3 level.

- This facility discharges to a receiving stream where special standard "bb" applies. Special standard "bb" applies site specific numerical chlorophyll a criteria; however, these are addressed in James River segments through the nutrient general permit and RCWQMP; therefore, associated monitoring or limitation is not required in this permit.

- While the pretreatment program for Chesterfield County (both Proctor's Creek and Falling Creek WWTPs) addresses a total of 34 SIUs, only 3 of those SIUs have the ability to discharge to Falling Creek.

- Stormwater monitoring is not addressed in this individual permit because the facility's stormwater collection system is permitted separately under the VAR05 general VPDES permit for point source discharges of storm water associated with industrial activity through VPDES Permit No. VAR051258.

- In order for the 2018 permit term to begin with a complete calendar month, the expiration date of the 2013 permit has been shortened to July 31, 2018.

25. 303(d) Listed Segments (TMDL): This facility discharges directly to Grindall Creek and the James River. The James River stream segment receiving the effluent was listed during the 2010 305(b)/303(d) assessment for not supporting the Fish Consumption Use due to a VDH fish consumption advisory for PCBs, the Recreation Use due to E. coli exceedances, and the Aquatic Life Use due to low dissolved oxygen, inadequate submerged aquatic vegetation (SAV), and excessive chlorophyll a. In addition, the river has observed effects for the Fish Consumption Use due to mercury and kepone exceedances in fish tissue. Grindall Creek was assessed with a fully

supporting Fish Consumption Use, but with observed effects due to the VDH fish consumption advisory for kepone. No other concerns were identified on Grindall Creek.

This facility was included in the James River and Tributaries – City of Richmond Bacterial TMDL, approved by EPA on 11/4/2010. The facility received a wasteload allocation of 1.76E+13 *E. coli* cfu per year, which is equivalent to 126 cfu/100 mL at design capacity of 10.1 MGD. As a result of the permit authorized flow increase from 10.1 to 12.0 MGD, an additional allocation of 3.3E+12 cfu/year *E. coli* has been allocated to this facility from the future growth available in the existing, approved TMDL, resulting in a revised allocation of 2.09E+13 *E. coli* cfu per year. This revised allocation remains equivalent to the effluent limitation of 126 cfu/100mL in Part I.A.1 of the 2013 facility permit, which is therefore in compliance with the TMDL based wasteload allocation.

No limit for PCBs is included in the permit because the facility provided analytical data with the permit application which indicated that PCBs are not present in the effluent above accepted quantitation levels.

Neither mercury nor kepone were detected in the facility's effluent when sampled for permit reissuance; therefore, this facility is not expected to contribute to the observed effects listed above.

The facility discharges to the James River Tidal Freshwater segment (JMSTF2) of the Chesapeake Bay watershed. The receiving stream has been addressed in the Chesapeake Bay TMDL, approved by EPA on December 29, 2010. The TMDL addresses dissolved oxygen (DO), chlorophyll a, and submerged aquatic vegetation (SAV) impairments in the main stem Chesapeake Bay and its tidal tributaries by establishing non-point source load allocations (LA) and point-source waste load allocations (WLAs) for Total Nitrogen (TN), Total Phosphorus (TP) and Total Suspended Solids (TSS) to meet applicable Virginia Water Quality Standards contained in 9VAC25-260-185. This facility is considered a Significant Chesapeake Bay wastewater discharge. All Significant Chesapeake Bay wastewater discharges in the Upper Tidal Freshwater James River segment (JMSTF2) have been assigned aggregate WLAs of 4,454,769.63 pounds per year TN, 370,167.48 pounds per year TP, and 45,474,581.82 pounds per year TSS.

Implementation of the Chesapeake Bay TDML is currently accomplished in accordance with the Commonwealth of Virginia's Phase I Watershed Implementation Plan (WIP), approved by EPA on December 29, 2010. The approved WIP recognizes that the TMDL nutrient WLAs for Significant Chesapeake Bay wastewater dischargers are set in two regulations: 1) the Water Quality Management Planning Regulation (9VAC25-720); and 2) the "General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed of Virginia" (9VAC25-820). The WIP further outlines that since TSS discharges from wastewater facilities represent an insignificant portion of the Bay's total sediment load, they may be considered in the aggregate. The WIP establishes that wastewater discharges with technology-based TSS limits are considered consistent with the TMDL.

DEQ has provided coverage under the VPDES Nutrient General Permit (GP) for this facility under permit VAN040080. The requirements of the Nutrient GP currently in effect for this facility are consistent with the Chesapeake Bay TMDL. Chesterfield County has elected to combine (i.e. "bubble") the allocated loads for the Proctor's Creek and Falling Creek WWTPs as allowed under the WGP. The total calendar year nitrogen allocation is 564952 lb/year total nitrogen and 56495 lb/year total phosphorus. Despite the plant re-rating from 10.1 MGD to 12.0 MGD, these load allocations do not increase.

This individual permit includes TSS limits of 13 mg/L June – October and 20 mg/L November – May, that are also consistent with the Chesapeake Bay TMDL and WIP. In addition, the individual permit has $cBOD_5$ limits of 13 mg/L June – October and 20 mg/L November – May; a total nitrogen annual average limit of 5.8 mg/L and a dissolved oxygen limit of 5.9 mg/L. Given these limits, this facility can neither cause nor contribute to an observed violation of the standards, and is consistent with the TMDL.

In addition, the individual permit has limits for cBOD5, ammonia, and DO consistent with the RCWQMP that provide protection of instream DO concentrations to at least 5.0 mg/L. However, implementation of the full Chesapeake Bay WIP, including GP reductions combined with actions proposed in other source sectors, is expected to adequately address ambient conditions such that the proposed effluent limits of this individual permit are consistent with the Chesapeake Bay TMDL, and will not cause an impairment or observed violation of the standards for DO, chlorophyll a, or SAV as required by 9VAC25-260-185.

26. Summary of attachments to this Fact Sheet:

Attachment A	Flow Frequency Determination
Attachment B	Facility Diagram and Location Map
Attachment C	Ambient Data
Attachment D	Inspection Report
Attachment E	1992 Model of Mixing Conditions
Attachment F	Effluent Limitation Analysis Documents
Attachment G	Nutrient Limitation Support Documents
Attachment H	WET Testing Evaluation and Memorandum
Attachment I	Response to Owner Comments

Attachment A

Flow Frequency Determination

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Falling Creek WWTP – VA0024996

TO: Brad Ricks, P.G.

FROM: Jennifer Palmore, P.G.

DATE: December 12, 2012

COPIES: File

The Chesterfield County's Falling Creek Wastewater Treatment Plant (WWTP) is located near Bellwood, Virginia. Outfall 001 discharges to the James River at rivermile 2-JMS103.11; outfalls 002 and 003 discharge to Grindall Creek at rivermile 2-GRK000.17. Flow frequencies have been requested for this outfall for use in developing effluent limitations for the VPDES permit.

Outfall 001 – James River

The James River is tidally influenced at the discharge point of outfall 001. Flow frequencies cannot be developed for tidal waters; however, for modeling purposes the freshwater inflow at the fall line of the James River (I-95 bridge) is being included. The flow frequencies were developed based on a drainage area comparison between the fall line and the USGS continuous record gage on the James River at the Route 45 bridge in Cartersville (#02035000). The gage has been in operation from 1898 through present. However, the flow in the James has been regulated since December 1979 by guaranteed releases from Gathwright Dam (Lake Moomaw); therefore, the flow frequencies for the gage were developed based on data since from water year 1980. The data for the reference gage and the fall line are presented below. This analysis does not address the withdrawals and discharges, or any springs influencing the flow of the James River.

James River at Cartersville, VA (#02035000):
Period of record: 1980-2003
Drainage area: 6,257 mi^2
High Flow Months: January - May

1Q30 = 540 cfs	High Flow 1Q10 = 1530 cfs
1Q10 = 638 cfs	High Flow 7Q10 = 1810 cfs
7Q10 = 717 cfs	High Flow 30Q10 = 2220 cfs
30Q10 = 918 cfs	HM = 3020 cfs
30Q5 = 1020 cfs	

James River at fall line:
Drainage Area: 6,755 mi^2

1Q30 = 583 cfs (377 MGD)	High Flow 1Q10 = 1652 cfs (1068 MGD)
1Q10 = 689 cfs (445 MGD)	High Flow 7Q10 = 1954 cfs (1263 MGD)
7Q10 = 774 cfs (500 MGD)	High Flow 30Q10 = 2397 cfs (1549 MGD)
30Q10 = 992 cfs (641 MGD)	HM = 3260 cfs (2107 MGD)
30Q5 = 1101 cfs (712 MGD)	

During the 2010 305(b)/303(d) Integrated Water Quality Assessment Report, the James River was considered a Category 5A water in ("A Water Quality Standard is not attained. The applicable fact sheets are attached. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list)."). The river was impaired of the Fish Consumption Use due to a VDH fish consumption advisory for PCBs, the Recreation Use due to E. coli exceedances, and the Aquatic Life Use

due to low dissolved oxygen, inadequate submerged aquatic vegetation (SAV), and excessive chlorophyll_a. In addition, the river is considered to have "observed effects" for the Fish Consumption Use due to fish tissue exceedances for mercury and a VDH fish consumption advisory for kepone; these are not impairing causes. The Wildlife Use was fully supporting.

In the draft 2012 305(b) report, the river was assessed as a Category 5D water ("The Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.") The applicable fact sheets are attached. The river was impaired of the Fish Consumption Use due to a VDH fish consumption advisory for PCBs, the Recreation Use due to E. coli exceedances, and the Aquatic Life Use due to previous dissolved oxygen violations, inadequate submerged aquatic vegetation (SAV), poor benthic community, and excessive chlorophyll_a. In addition, the river is considered to have observed effects for the Fish Consumption Use due to fish tissue exceedances for mercury, PCB exceedances in water column sampling, and a VDH fish consumption advisory for kepone, as well as observed effects under the Aquatic Life Use due to the PCB water exceedances. The Wildlife Use was fully supporting.

The James River is considered a Tier 1 water. The Richmond-Crater Water Quality Management Plan allocated $cBOD_5$, ammonia, and dissolved oxygen to various dischargers in order to maintain an instream dissolved oxygen of 5.0 mg/L, which was the minimum daily average water quality standard at the time that the plan was adopted.

Water quality data from monitoring station 2-JMS104.16 is attached. The station is located at Buoy 166 and is approximately 1 mile upstream of the outfall.

Outfalls 002 and 003 – Grindall Creek

The USGS operated a continuous record gage on Falling Creek near Chesterfield, VA (#02038000) from 1955 through 1994. The gage was located at the Route 651 bridge (Belmont Road) in Chesterfield County. The flow frequencies for Grindall Creek at the discharge point were determined from the Falling Creek flows using drainage area proportion. The flow frequencies for the gage and the discharge point are presented below and do not address any withdrawals, discharges, or springs.

Falling Creek near Chesterfield, VA (#02038000):

Period of record: 1955-1994
Drainage area: 32.8 mi^2
High Flow Months: January - April

1Q30 = 0.12 cfs	High Flow 1Q10 = 5.2 cfs
1Q10 = 0.42 cfs	High Flow 7Q10 = 6.3 cfs
7Q10 = 0.50 cfs	High Flow 30Q10 = 11 cfs
30Q10 = 0.73 cfs	HM = 3.9 cfs
30Q5 = 1.5 cfs	

Grindall Creek at Outfalls 002 and 003:

Drainage Area: 2.17 mi^2

1Q30 = 0.008 cfs (0.005 MGD)	High Flow 1Q10 = 0.34 cfs (0.22 MGD)
1Q10 = 0.028 cfs (0.018 MGD)	High Flow 7Q10 = 0.42 cfs (0.27 MGD)
7Q10 = 0.033 cfs (0.021 MGD)	High Flow 30Q10 = 0.73 cfs (0.47 MGD)
30Q10 = 0.048 cfs (0.031 MGD)	HM = 0.26 cfs (0.17 MGD)
30Q5 = 0.10 cfs (0.064 MGD)	

During the 2010 305(b)/303(d) Integrated Water Quality Assessment Report, Grindall Creek was assessed as a Category 2B water ("Waters are of concern to the state but no Water Quality Standard exists for a specific pollutant, or the water exceeds a state screening value or toxicity test."). The Fish

Consumption Use is considered fully supporting with observed effects due to the VDH fish consumption advisory for kepone.

In the draft 2012 report, the creek is also considered a Category 2B water. The Aquatic Life Use and Wildlife Uses were fully supporting, the Fish Consumption Use is fully supporting with observed effects due to the kepone advisory and due to a PCB water column exceedance, and the Recreation Use was not assessed.

TMDLs

The Falling Creek WWTP was included in the James River and Tributaries – City of Richmond Bacterial TMDL, which was approved by the EPA on 11/4/2010 and by the SWCB on 6/29/2012. The facility received an E. coli wasteload allocation (WLA) of 1.76E+13 cfu/year based on a design flow of 10.1 MGD. If the facility wishes to expand to 12.0 MGD, they would need to reduce their E. coli limit in order to meet their current WLA or petition DEQ staff for a TMDL modification to increase their allocation, if possible.

The facility was also addressed in the Chesapeake Bay TMDL, which was approved by the EPA on 12/29/2010. The TMDL allocates loads for total nitrogen, total phosphorus, and total suspended solids to protect the dissolved oxygen and submerged aquatic vegetation acreage criteria in the Chesapeake Bay and its tidal tributaries. The discharge was included in the aggregated loads for significant wastewater dischargers in the upper tidal freshwater James River estuary (JMSTF2). The nutrient allocations are administered through the Watershed Nutrient General Permit; the TSS allocations are considered aggregated and facilities with technology-based TSS limits are considered to be in conformance with the TMDL.

If you have any questions concerning this analysis, please let me know.

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-01-BAC** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.2581 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1996

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Estuarine James River from the fall line at Mayos Bridge downstream to the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E.coli

The James River from the fall line to the Appomattox River has been assessed as not supporting of the Recreation use support goal based on the results of a summer special study in the fall zone. The special study was designed to monitor the effects of summertime rain and combined sewer overflow (CSO) events on water quality in the James River and to monitor the effects of Richmond's CSO abatement efforts.

The segment has been included on the Impaired Waters list for fecal coliform since 1996. During the 2004 and 2006 cycles, the bacteria standard changed to E.coli for those stations with enough data. Some of the areas in this segment had converted to the E.coli standard, for others the fecal coliform standard was still in effect. During the 2008 cycle, the impairment was converted solely to E. coli. The TMDL for bacteria is due in 2010.

Bacteria impairment is noted at the following stations during the 2010 cycle:
2-JMS110.30
2-JMS104.16
2-JMS099.30

Although station 2-JMS087.01 is currently passing (5/50), the downstream extent will remain the same for this cycle due to the historical impairment and the marginal passing rate.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and should not be included in the bacterial impairment, which only included the "estuarine James River".

IMPAIRMENT SOURCE: NPS - Urban, CSO

The source of the impairment in this section of the river is believed to be urban runoff from the tributary drainage basin and from combined sewer overflow events from the City of Richmond's combined sewer system.

The City is currently undertaking CSO abatement efforts. It is recommended that the ongoing CSO special study be continued to gauge the effects of CSO abatement efforts on water quality in this segment.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-02-CHLA** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 5.5117 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFu/JMSTFl boundary at the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Not Supporting

IMPAIRMENT: Chlorophyll

The James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

A special site-specific chlorophyll standard for the mainstem James River was adopted during the 2008 cycle. The upper tidal freshwater segment exceeds both the spring and summer seasonal means.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and should not be included in the chlorophyll a impairment, which only includes the mainstem James River.

IMPAIRMENT SOURCE: Point sources, Nonpoint Sources

The James River Tributary Strategy was developed to bring the river into attainment.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River and Various Tributaries**

TMDL ID: **G01E-03-PCB** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2014

IMPAIRED SIZE: ~325 - Stream mile **Watershed:** VAP-G01E

INITIAL LISTING: 2002

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Hampton Roads Bridge Tunnel

Estuarine James River from the fall line to the Hampton Roads Bridge Tunnel, including several tributaries listed below.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Fish Tissue - PCBs, VDH Fish Consumption Restriction

During the 2002 cycle, the James River from the Fall line to Queens Creek was considered not supporting of the Fish Consumption Use due to PCBs in multiple fish species at multiple DEQ monitoring locations.

During the 2004 cycle, a VDH Fish Consumption Restriction was issued from the fall line to Flowerdew Hundred and the segment was adjusted slightly to match the Restriction. In addition, in the 2004 cycle, the Chickahominy River from Walkers Dam to Diascund Creek was assessed as not supporting the Fish Consumption Use because the DEQ screening value for PCBs was exceeded in 3 species during sampling in 2001.

During the 2006 cycle, the VDH restriction was extended on 12/13/2004 to extend from the I-95 bridge downstream to the Hampton Roads Bridge Tunnel and include the tidal portions of the following tributaries:

Appomattox River up to Lake Chesdin Dam
Bailey Creek up to Route 630
Bailey Bay
Chickahominy River up to Walkers Dam
Skiffes Creek up to Skiffes Creek Dam
Pagan River and its tributary Jones Creek
Chuckatuck Creek
Nansemond River and its tributaries Bennett Creek and Star Creek
Hampton River
Willoughby Bay and the Elizabeth R. system (Western, Eastern, and Southern Branches and Lafayette R.) and tributaries St. Julian Creek, Deep Creek, and Broad Creek

The advisory was modified again on 10/10/2006 to add Poythress Run.

The impairments were combined. The TMDL for the lower extended portion is due in 2018.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and is not included in the VDH Fish Consumption Advisory.

IMPAIRMENT SOURCE: Unknown

The source of the PCBs is considered unknown.

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River Tidal Freshwater (Upper) Estuary**

TMDL ID: **JMSTFU-DO-BAY** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5749 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Dissolved Oxygen

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

The CB water quality standards were implemented during the 2006 cycle. The 30-day dissolved oxygen criteria was met during the 2006 and 2008 cycles; however, during the 2010 cycle, the segment failed the summer 30-day Open Water dissolved oxygen criteria. The rest-of-year standard was met.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The tributary strategy for the James River assigned sources and allocations.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River Tidal Freshwater (Upper) Estuary**

TMDL ID: **JMSTFU-SAV-BAY** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5998 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Shallow Water Use - Not Supporting

IMPAIRMENT: Aquatic Macrophytes

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

During the 2006 cycle, the CB water quality standards were implemented. The Upper Tidal Freshwater James River from the fall line to the Appomattox fails the Shallow Water Use SAV criteria.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The tributary strategy for the James River assigned sources and allocations.

RECOMMENDATION: Problem Characterization

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin

HYDROLOGIC UNIT: 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-01-BAC**

2012 IMPAIRED AREA ID: CB-JMSTFU

ASSESSMENT CATEGORY: 4A

TMDL DUE DATE: 2010

IMPAIRED SIZE: 6.2581 - Sq. Mi.

Watershed: VAP-G01E

INITIAL LISTING: 1996

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Estuarine James River from the fall line at Mayos Bridge downstream to the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E.coli

The James River from the fall line to the Appomattox River has been assessed as not supporting of the Recreation use support goal based on the results of a summer special study in the fall zone. The special study was designed to monitor the effects of summertime rain and combined sewer overflow (CSO) events on water quality in the James River and to monitor the effects of Richmond's CSO abatement efforts.

The segment has been included on the Impaired Waters list for fecal coliform since 1996. During the 2004 and 2006 cycles, the bacteria standard changed to E.coli for those stations with enough data. Some of the areas in this segment had converted to the E.coli standard, for others the fecal coliform standard was still in effect. During the 2008 cycle, the impairment was converted solely to E. coli. The TMDL for bacteria was due in 2010.

Bacteria impairment is noted at multiple stations during the 2012 cycle. Although several stations in the lower part of the impairment are currently passing, the segment size will remain the same for this cycle due to the historical impairment, the marginal passing rate, and several violation rates which would otherwise be considered observed effects.

The James River and Tributaries - City of Richmond Bacterial TMDL was approved by the EPA on 11/4/2010. The river is considered Category 4A.

IMPAIRMENT SOURCE: Nonpoint Sources, CSOs, Point Sources, MS4s

Bacteria were allocated to point and nonpoint sources, including CSOs, and MS4s.

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin

HYDROLOGIC UNIT: 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-02-CHLA**

2012 IMPAIRED AREA ID: CB-JMSTFU

ASSESSMENT CATEGORY: 4A

TMDL DUE DATE: 2010

IMPAIRED SIZE: 5.5117 - Sq. Mi.

Watershed: VAP-G01E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFu/JMSTFl boundary at the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Not Supporting

IMPAIRMENT: Chlorophyll

The James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

A special site-specific chlorophyll standard for the mainstem James River was adopted during the 2008 cycle. During the 2012 cycle, the upper tidal freshwater segment exceeds the summer seasonal mean however it is in compliance with the spring mean.

The Chesapeake Bay TMDL was approved by the EPA on 12/29/2010, therefore the impairment will be considered Category 4A. However, the TMDL ID was not available at the time of the 2012 assessment.

IMPAIRMENT SOURCE: Point sources, Nonpoint Sources

The Chesapeake Bay TMDL allocates total nitrogen, total phosphorus, and total suspended solids from point and nonpoint sources across the Bay watershed as well as atmospheric sources.

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-02-EBEN** **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2024

IMPAIRED SIZE: 31.5967 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 2012

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFl/JMSOH boundary.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Benthic Macroinvertebrates

During the 2012 cycle, the mainstem James River within the tidal freshwater estuary was impaired of the Aquatic Life Use due to an inadequate benthic community based on the Chesapeake Bay Benthic Index of Biological Integrity.

This is supported by benthic alteration at 2010 Coastal 2000 stations 2CJMS055.04 and 2CJMS084.70, which were considered Category 5A. The source is "possibly cumulative chronic effects of metals and PAHs in the sediment".

IMPAIRMENT SOURCE: Unknown

The source of the impairment is unknown.

RECOMMENDATION: Problem Characterization

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River and Various Tributaries**

TMDL ID: **G01E-03-PCB** **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2014

IMPAIRED SIZE: ~325 - Stream mile **Watershed:** VAP-G01E

INITIAL LISTING: 2002

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Hampton Roads Bridge Tunnel

Estuarine James River from the fall line to the Hampton Roads Bridge Tunnel, including several tributaries listed below.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Fish Tissue - PCBs, VDH Fish Consumption Restriction

During the 2002 cycle, the James River from the Fall line to Queens Creek was considered not supporting of the Fish Consumption Use due to PCBs in multiple fish species at multiple DEQ monitoring locations.

During the 2004 cycle, a VDH Fish Consumption Restriction was issued from the fall line to Flowerdew Hundred and the segment was adjusted slightly to match the Restriction. In addition, in the 2004 cycle, the Chickahominy River from Walkers Dam to Diascund Creek was assessed as not supporting the Fish Consumption Use because the DEQ screening value for PCBs was exceeded in 3 species during sampling in 2001.

During the 2006 cycle, the VDH restriction was extended on 12/13/2004 to extend from the I-95 bridge downstream to the Hampton Roads Bridge Tunnel and include the tidal portions of the following tributaries:

Appomattox River up to Lake Chesdin Dam
Bailey Creek up to Route 630
Bailey Bay
Chickahominy River up to Walkers Dam
Skiffes Creek up to Skiffes Creek Dam
Pagan River and its tributary Jones Creek
Chuckatuck Creek
Nansemond River and its tributaries Bennett Creek and Star Creek
Hampton River
Willoughby Bay and the Elizabeth R. system (Western, Eastern, and Southern Branches and Lafayette R.) and tributaries St. Julian Creek, Deep Creek, and Broad Creek

The advisory was modified again on 10/10/2006 to add Poythress Run.

The impairments were combined. The TMDL for the lower extended portion is due in 2018.

IMPAIRMENT SOURCE: Unknown

The source of the PCBs is considered unknown.

RECOMMENDATION: Toxic Source Assessment

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River Tidal Freshwater (Upper) Estuary**

TMDL ID: **JMSTFU-DO-BAY** **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5749 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Dissolved Oxygen

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

The CB water quality standards were implemented during the 2006 cycle. The 30-day dissolved oxygen criteria was met during the 2006 and 2008 cycles; however, during the 2010 cycle, the segment failed the summer 30-day Open Water dissolved oxygen criteria. The rest-of-year standard was met.

During the 2012 cycle, the Chesapeake Bay TMDL was approved by the EPA on 12/29/2010 and addresses dissolved oxygen and submerged aquatic vegetation impairments throughout the Chesapeake Bay and its tidal tributaries. The upper James River estuary was once again fully supporting of both the Open Water 30-day mean criteria, however EPA policy indicates that it must remain listed until all dissolved oxygen criteria can be assessed, therefore it is Category 4A.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

There does not appear to be a current dissolved oxygen impairment in the upper James River estuary

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River Tidal Freshwater (Upper) Estuary**

TMDL ID: **JMSTFU-SAV-BAY** **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5998 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Shallow Water Use - Not Supporting

IMPAIRMENT: Aquatic Macrophytes

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

During the 2006 cycle, the CB water quality standards were implemented.

During the 2012 cycle, the Upper Tidal Freshwater James River from the fall line to the Appomattox fails the Shallow Water Subuse's submerged aquatic vegetation (SAV) and water clarity criteria. The TMDL was approved by the EPA on 12/29/2010, therefore the segment is considered a Category 4A water. However the TMDL ID was not available at the time of the 2012 assessment.

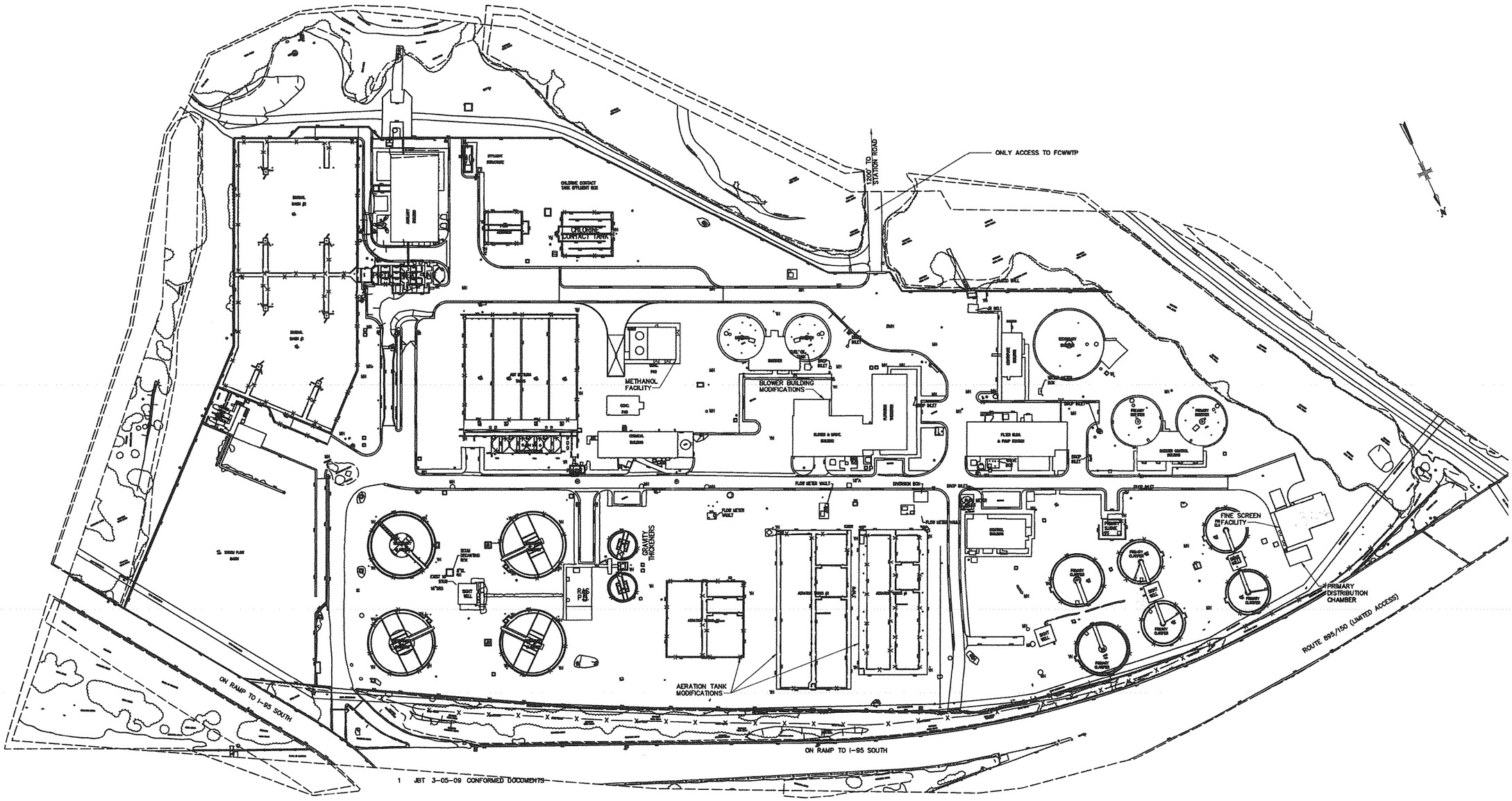
IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The Chesapeake Bay TMDL allocates total nitrogen, total phosphorus, and total suspended solids to point- and nonpoint sources throughout the Bay watershed.

RECOMMENDATION: Implementation

Attachment B

Facility Diagram and Location Map



1 JBT 3-05-09 CONFORMED DOCUMENTS

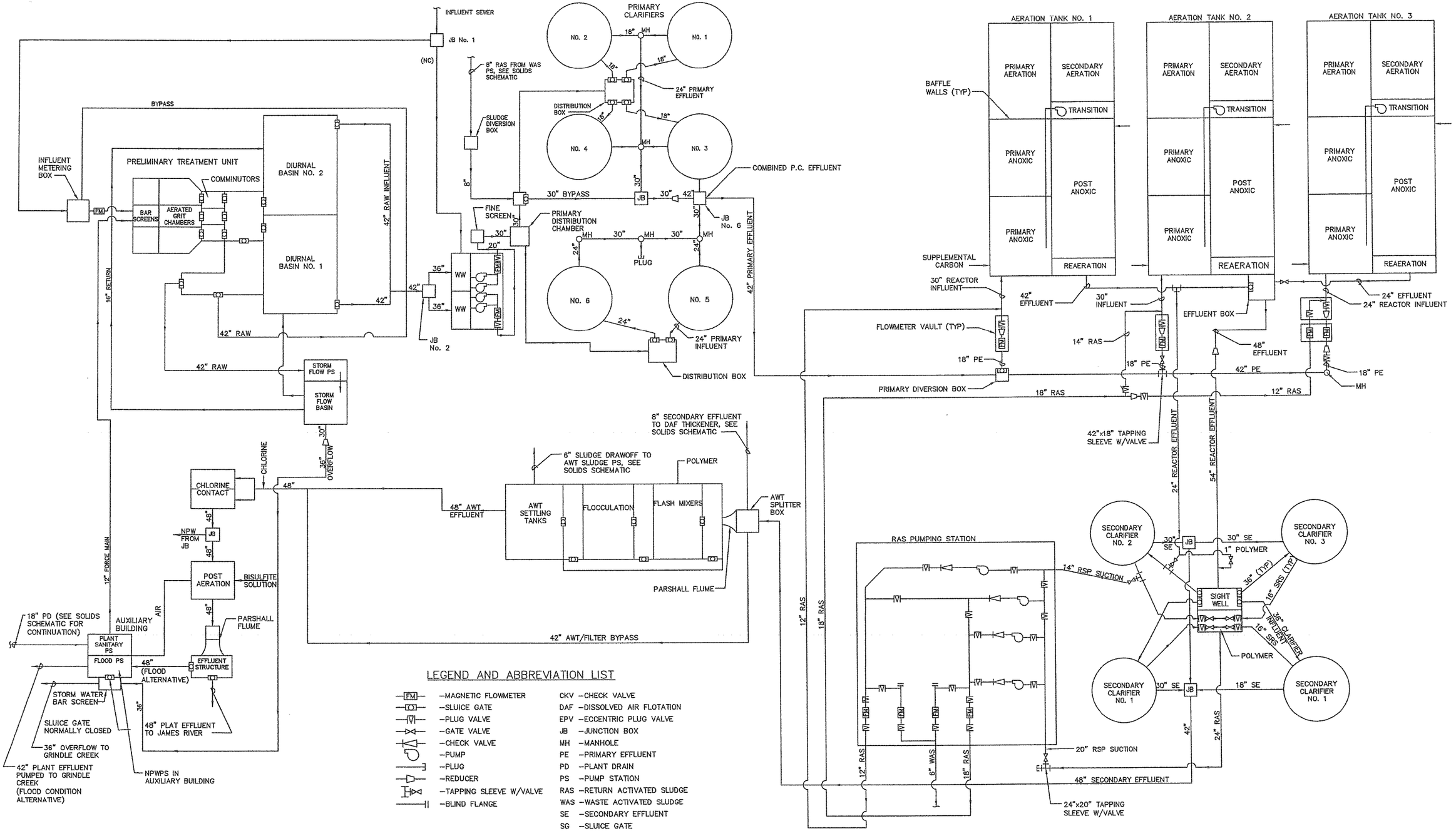
MALCOLM PIRNIE

COUNTY OF CHESTERFIELD, VIRGINIA

FALLING CREEK WWTP

NUTRIENTS COMPLIANCE FOR FALLING CREEK WWTP

OVERALL SITE PLAN



LEGEND AND ABBREVIATION LIST

FM —MAGNETIC FLOWMETER	CKV —CHECK VALVE
—SLUICE GATE	DAF —DISSOLVED AIR FLOTATION
—PLUG VALVE	EPV —ECCENTRIC PLUG VALVE
—GATE VALVE	JB —JUNCTION BOX
—CHECK VALVE	MH —MANHOLE
—PUMP	PE —PRIMARY EFFLUENT
—PLUG	PD —PLANT DRAIN
—REDUCER	PS —PUMP STATION
—TAPPING SLEEVE W/VALVE	RAS —RETURN ACTIVATED SLUDGE
—BLIND FLANGE	WAS —WASTE ACTIVATED SLUDGE
	SE —SECONDARY EFFLUENT
	SG —SLUICE GATE
	FM —FLOW METER
	WW —WETWELL
	AWT —ADVANCED WASTE TREATMENT
	NPW —NON POTABLE WATER
	P.C. —PRIMARY CLARIFIER
	TYP. —TYPICAL

NOTE:
ALL PIPING, VALVES, AND APPURTENANCES NOT SHOWN.

MALCOLM PIRNIE

CHESTERFIELD COUNTY, VIRGINIA
FALLING CREEK WASTEWATER TREATMENT PLANT
OPERATIONS AND MAINTENANCE

LIQUID PROCESS SCHEMATIC

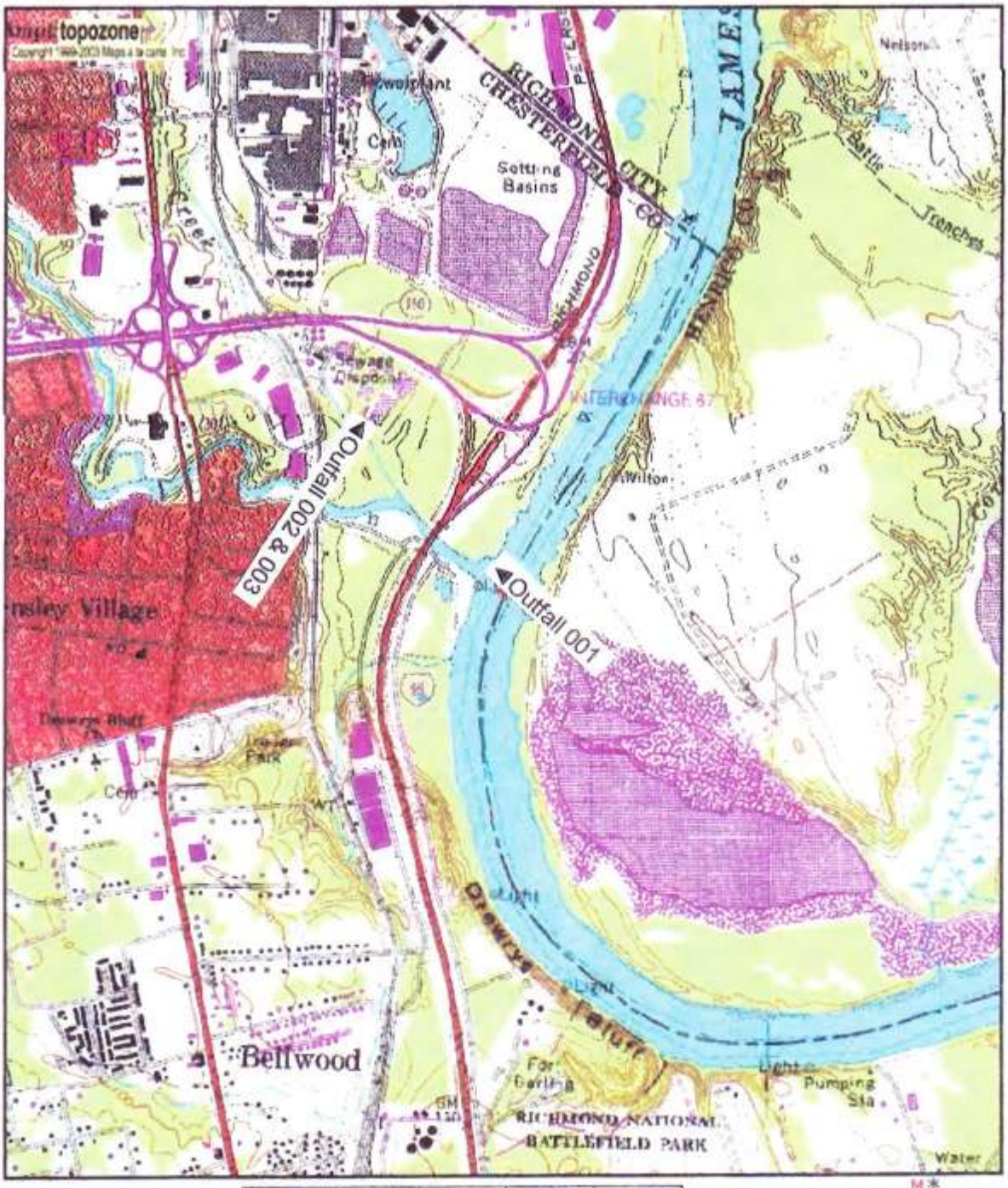
NOT TO SCALE

MALCOLM PIRNIE, INC.

DATE

Fig. 2.0-1

0640FC070



37° 26' 10"N, 77° 25' 37"W (NAD83/WGS84)

Falling Creek, USGS Drewrys Bluff (VA) Quadrangle

Projection is UTM Zone 18 NAD83 Datum

Attachment C

Ambient Data

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	7/22/1968	S	0.3	30	7.5		5
2-JMS104.16	9/8/1968	S	0.3	26.67	7		1
2-JMS104.16	3/20/1969	S	0.3	11.11	7.2		10.39
2-JMS104.16	6/19/1969	S	0.3	25.56	6.7		6.2
2-JMS104.16	10/2/1969	S	0.3	23.33	7.2		7
2-JMS104.16	4/21/1970	S	0.3	16.11	7.5		8
2-JMS104.16	5/8/1970	S	0.3	17.78	7.2		8.5
2-JMS104.16	6/18/1970	S	0.3	26.67	6.8		3.2
2-JMS104.16	7/2/1970	S	0.3	27.22	6.9		2.4
2-JMS104.16	7/22/1970	S	0.3	27.78	7.2		1
2-JMS104.16	8/15/1970	S	0.3	31.11	7.3		4.4
2-JMS104.16	8/26/1970	S	0.3	27.78	6.7		3
2-JMS104.16	9/9/1970	S	0.3	28.33	7.2		2.8
2-JMS104.16	5/6/1971	S	0.3	17.22	7.6		7.8
2-JMS104.16	6/13/1971	S	0.3	23.33	8.3		8
2-JMS104.16	7/23/1971	S	0.3	28.33	7.7		6.4
2-JMS104.16	8/3/1971	S	0.3	30.56	7.6		6
2-JMS104.16	8/31/1971	S	0.3	28.33	7.3		6
2-JMS104.16	9/26/1971	S	0.3	21.11	8		7
2-JMS104.16	10/27/1971	S	0.3	18.89	7		9.2
2-JMS104.16	5/2/1972	S	0.3	19.44	7.3		8.2
2-JMS104.16	6/17/1972	S	0.3	26.67	7.6		6
2-JMS104.16	7/8/1972	S	0.3	21.11	7.3		9.2
2-JMS104.16	7/31/1972	S	0.3	23.89	8		7.8
2-JMS104.16	8/9/1972	S	0.3	26.67	7.5		7.8
2-JMS104.16	8/20/1972	S	0.3		7.5		7
2-JMS104.16	9/5/1972	S	0.3	25	7.3		6
2-JMS104.16	10/4/1972	S	0.3	20	7.5		7.6
2-JMS104.16	5/3/1973	S	0.3	17.78	7.1		7.8
2-JMS104.16	6/6/1973	S	0.3	26.11	8		8
2-JMS104.16	6/9/1973	S	0.3	27.22	7.9		1.3
2-JMS104.16	7/15/1973	S	0.3	29.44	7.7		6.8
2-JMS104.16	9/29/1973	S	0.3	29.44	7.5		4.4
2-JMS104.16	5/26/1974	S	0.3	23.33	7.3		9
2-JMS104.16	6/7/1974	S	0.3	21.67	7.5		9
2-JMS104.16	6/27/1974	S	0.3	24.44	7.3		7.2
2-JMS104.16	7/2/1974	S	0.3	26.67	7.5		7.7
2-JMS104.16	7/26/1974	S	0.3	26.11	8		6.8
2-JMS104.16	8/5/1974	S	0.3	27.22	7.6		7.2
2-JMS104.16	8/30/1974	S	0.3	28	7.5		7.2
2-JMS104.16	9/26/1974	S	0.3	22	7.5		7.4
2-JMS104.16	10/25/1974	S	0.3	15	8		9.5
2-JMS104.16	5/1/1975	S	0.3	16.11	7.5		9.6
2-JMS104.16	6/4/1975	S	0.3		7.3		7.7
2-JMS104.16	6/24/1975	S	0.3	29.44	9		8.8
2-JMS104.16	6/30/1975	S	0.3	25.56	7.4		7.8
2-JMS104.16	7/28/1975	S	0.3	26.67	7.5		7.6
2-JMS104.16	8/13/1975	S	0.3	28.89	8.5		6.8
2-JMS104.16	8/16/1975	S	0.3	28.89	8.3		6.8
2-JMS104.16	9/3/1975	S	0.3	23.33	7.5		7.9
2-JMS104.16	10/1/1975	S	0.3	20	7.5		9.2

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	2/12/1976	S	0.3	5.56	7.5		12.79
2-JMS104.16	3/11/1976	S	0.3	12.22	7.7		10
2-JMS104.16	5/4/1976	S	0.3	19	7.5		9.2
2-JMS104.16	6/7/1976	S	0.3	21.11	7.2		8.5
2-JMS104.16	5/22/1978	S	0.3	20.5	8.5		9
2-JMS104.16	6/15/1978	S	0.3	25.5	8.5		4.7
2-JMS104.16	7/11/1978	S	0.3	29	8.1		5.6
2-JMS104.16	8/3/1978	S	0.3	29.5	7.5		6
2-JMS104.16	9/25/1978	S	0.3	24	8.3		7.4
2-JMS104.16	12/12/1978	S	0.3	7	7.5		12
2-JMS104.16	4/24/1979	S	0.3	18	7.6		8.7
2-JMS104.16	5/19/1980	S	0.3	21	8.5		8.4
2-JMS104.16	7/16/1980	S	0.3	30	8.5		7.2
2-JMS104.16	10/20/1980	S	0.3	19	7.3		6
2-JMS104.16	7/27/1981	S	0.3	27.5	8.2		6.7
2-JMS104.16	9/8/1981	S	0.3	25	7.8		7.7
2-JMS104.16	5/13/1982	S	0.3	23	9		6.2
2-JMS104.16	6/24/1982	S	0.3	24	7.5		7.1
2-JMS104.16	8/9/1982	S	0.3	27.5	7.8		5.4
2-JMS104.16	10/28/1982	S	0.3	13.5	7.7		11.1
2-JMS104.16	11/18/1982	S	0.3	9	7.3		11.3
2-JMS104.16	5/17/1983	S	0.3	18.5	8		9.7
2-JMS104.16	6/28/1983	S	0.3	29.5	7.4		7.2
2-JMS104.16	7/28/1983	S	0.91	27.5	7.8		7.3
2-JMS104.16	8/16/1983	S	0.91				
2-JMS104.16	8/30/1983	S	0.91	29.5	8		7.4
2-JMS104.16	9/27/1983	S	0.91	21	8		7.8
2-JMS104.16	10/12/1983	S	0.91				
2-JMS104.16	6/29/1988	S	1	25	7.87	6.62	
2-JMS104.16	6/29/1988	M	3	24.5		6.3	
2-JMS104.16	6/29/1988	M	5	24.4		6.34	
2-JMS104.16	6/29/1988	B	7	24.4	7.82	6.08	
2-JMS104.16	7/18/1988	S	8	31	7.44	5	
2-JMS104.16	7/18/1988	S	1	31	7.68	6.5	
2-JMS104.16	7/18/1988	M	3	31		5.6	
2-JMS104.16	7/18/1988	M	5	31		5.4	
2-JMS104.16	7/18/1988	M	7	31		5.1	
2-JMS104.16	7/18/1988	B	8	31	7.44	5	
2-JMS104.16	8/1/1988	S	1	29	7.48	6.59	
2-JMS104.16	8/1/1988	M	3	28.2		6.38	
2-JMS104.16	8/1/1988	M	5	28		6.22	
2-JMS104.16	8/1/1988	B	7	28	7.37	6.21	
2-JMS104.16	8/15/1988	S	1	29.3	8.07	7.89	
2-JMS104.16	8/15/1988	M	3	28.8		6.51	
2-JMS104.16	8/15/1988	M	5	28.6		6.27	
2-JMS104.16	8/15/1988	M	7	28.6		6.12	
2-JMS104.16	8/15/1988	B	8	28.6	7.87	6.01	
2-JMS104.16	9/12/1988	S	1	24.5	7.6	6.7	
2-JMS104.16	9/12/1988	M	3	24.3		6.6	
2-JMS104.16	9/12/1988	M	5	24.1		6.6	
2-JMS104.16	9/12/1988	M	7	24		6.5	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	9/12/1988	B	8	23.9	7.32	6.4	
2-JMS104.16	9/27/1988	S	1	22.6	7.48	6.7	
2-JMS104.16	9/27/1988	M	3	22.4		6.7	
2-JMS104.16	9/27/1988	M	5	22.4		6.7	
2-JMS104.16	9/27/1988	M	7	23.3		6.7	
2-JMS104.16	9/27/1988	B	9	22.3	7.4	6.7	
2-JMS104.16	10/11/1988	S	1	16.15	7.81	9.14	
2-JMS104.16	10/11/1988	M	3	16.1		9.17	
2-JMS104.16	10/11/1988	M	5	16		9.13	
2-JMS104.16	10/11/1988	M	7	15.9		9.07	
2-JMS104.16	10/11/1988	B	8	15.9	7.65	9.04	
2-JMS104.16	10/26/1988	S	1	14	7.58	8.33	
2-JMS104.16	10/26/1988	M	3	14		8.28	
2-JMS104.16	10/26/1988	M	5	13.9		8.31	
2-JMS104.16	10/26/1988	M	7	13.9		8.31	
2-JMS104.16	10/26/1988	M	9	13.9		8.76	
2-JMS104.16	10/26/1988	B	11	13.9	7.44	8.4	
2-JMS104.16	10/26/1988	S	1	14.2	8.11	9.61	
2-JMS104.16	10/26/1988	M	3	14.2		9.59	
2-JMS104.16	10/26/1988	M	5	14.1		9.61	
2-JMS104.16	10/26/1988	M	7	14.1		9.6	
2-JMS104.16	10/26/1988	B	8	14.1	7.83	9.57	
2-JMS104.16	11/14/1988	S	1	11.4	7.61	10.57	
2-JMS104.16	11/14/1988	M	3	11.3		10.64	
2-JMS104.16	11/14/1988	M	5	11.3		10.67	
2-JMS104.16	11/14/1988	M	7	11		10.68	
2-JMS104.16	11/14/1988	B	8	11	7.64	10.66	
2-JMS104.16	12/20/1988	S	1	2.68	7.62	14.15	
2-JMS104.16	12/20/1988	M	3	2.65		14.21	
2-JMS104.16	12/20/1988	M	5	2.61		14.25	
2-JMS104.16	12/20/1988	M	7	2.59		14.2	
2-JMS104.16	12/20/1988	B	9	2.6	7.59	14.18	
2-JMS104.16	1/11/1989	S	1	5.83	7.54	12.57	
2-JMS104.16	1/11/1989	M	3	5.7		12.49	
2-JMS104.16	1/11/1989	M	5	5.81		12.46	
2-JMS104.16	1/11/1989	M	7	5.66		12.45	
2-JMS104.16	1/11/1989	B	8	5.66	7.58	12.52	
2-JMS104.16	2/8/1989	S	1	6.49	7.65	12.12	
2-JMS104.16	2/8/1989	M	3	6.14		12.22	
2-JMS104.16	2/8/1989	M	5	6.06		12.29	
2-JMS104.16	2/8/1989	M	7	5.96		12.38	
2-JMS104.16	2/8/1989	B	9	5.89	7.75	12.42	
2-JMS104.16	3/15/1989	S	1	8.04	7.35	11.89	
2-JMS104.16	3/15/1989	M	3	7.84		11.92	
2-JMS104.16	3/15/1989	M	5	7.83		11.89	
2-JMS104.16	3/15/1989	M	7	7.82		11.84	
2-JMS104.16	3/15/1989	B	8	7.82	7.36	11.85	
2-JMS104.16	3/28/1989	S	1	13.2	7.35	10.6	
2-JMS104.16	3/28/1989	M	3	13.04		10.61	
2-JMS104.16	3/28/1989	M	5	12.98		10.57	
2-JMS104.16	3/28/1989	M	7	12.99		10.57	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	3/28/1989	B	8	13		10.56	
2-JMS104.16	4/13/1989	S	1	11.46	7.2	10.59	
2-JMS104.16	4/13/1989	M	3	11.5		10.54	
2-JMS104.16	4/13/1989	M	5	11.48		10.49	
2-JMS104.16	4/13/1989	M	7	11.32		10.55	
2-JMS104.16	4/13/1989	B	9	11.34	7.26	10.54	
2-JMS104.16	3/13/1990	S	1	14.31	7.56	9.75	
2-JMS104.16	3/13/1990	M	3	14.2		9.75	
2-JMS104.16	3/13/1990	M	5	14.22		9.7	
2-JMS104.16	3/13/1990	B	7	14.26	7.58	9.69	
2-JMS104.16	3/28/1990	S	1	10.52	7.42	11.02	
2-JMS104.16	3/28/1990	M	3	10.51		11.02	
2-JMS104.16	3/28/1990	M	5	10.45		11.01	
2-JMS104.16	3/28/1990	M	7	10.49		10.99	
2-JMS104.16	3/28/1990	B	8	10.52	7.46	10.92	
2-JMS104.16	4/10/1990	S	1	12.23	7.17	10.58	
2-JMS104.16	4/10/1990	M	3	12.23		10.58	
2-JMS104.16	4/10/1990	M	5	12.23		10.58	
2-JMS104.16	4/10/1990	M	7	12.21		10.59	
2-JMS104.16	4/10/1990	B	8	12.21	7.2	10.46	
2-JMS104.16	4/25/1990	S	1	18.73	7.46	8.72	
2-JMS104.16	4/25/1990	M	3	18.6		8.71	
2-JMS104.16	4/25/1990	M	5	18.66		8.69	
2-JMS104.16	4/25/1990	B	7	18.6	7.57	8.66	
2-JMS104.16	5/9/1990	S	1	20.19	7.42	8.31	
2-JMS104.16	5/9/1990	M	3	20.05		8.3	
2-JMS104.16	5/9/1990	M	5	20.07		8.32	
2-JMS104.16	5/9/1990	B	7	20.07	7.55	8.31	
2-JMS104.16	5/31/1990	S	1	18.36	7.27	9.17	
2-JMS104.16	5/31/1990	M	3	18.34		9.18	
2-JMS104.16	5/31/1990	M	5	18.34		9.15	
2-JMS104.16	5/31/1990	B	7	18.33	7.33	9.12	
2-JMS104.16	6/14/1990	S	1	25.2	7.35	7.67	
2-JMS104.16	6/14/1990	M	3	24.72		7.63	
2-JMS104.16	6/14/1990	M	5	24.49		7.63	
2-JMS104.16	6/14/1990	M	7	24.49		7.63	
2-JMS104.16	6/14/1990	B	8	24.5	7.38	7.56	
2-JMS104.16	6/27/1990	S	1	28.62	7.51	7.54	
2-JMS104.16	6/27/1990	M	3	27.93		7.01	
2-JMS104.16	6/27/1990	M	5	27.64		6.97	
2-JMS104.16	6/27/1990	B	7	27.61	7.39	7	
2-JMS104.16	7/10/1990	S	1	30.17	7.77	8.18	
2-JMS104.16	7/10/1990	M	3	29.58		8.14	
2-JMS104.16	7/10/1990	M	5	29.08		6.7	
2-JMS104.16	7/10/1990	B	7	29.01		6.24	
2-JMS104.16	7/24/1990	S	1	30.9	7.54	7.43	
2-JMS104.16	7/24/1990	M	3	30.49		6.83	
2-JMS104.16	7/24/1990	M	5	30.41		6.86	
2-JMS104.16	7/24/1990	M	7	30.16		7	
2-JMS104.16	7/24/1990	B	8	30.14	7.36	7.12	
2-JMS104.16	8/7/1990	S	1	27.56	7	6.75	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	8/7/1990	M	3	27.17		6.82	
2-JMS104.16	8/7/1990	M	5	27.05		6.81	
2-JMS104.16	8/7/1990	B	7	27	7	7.03	
2-JMS104.16	8/23/1990	S	1	25.98	7.15	7.17	
2-JMS104.16	8/23/1990	M	3	25.66		7.2	
2-JMS104.16	8/23/1990	M	5	28.57		7.26	
2-JMS104.16	8/23/1990	M	7	25.47		7.36	
2-JMS104.16	8/23/1990	B	9	25.48	7.16	7.65	
2-JMS104.16	9/6/1990	S	1	27.94	7.5	8.54	
2-JMS104.16	9/6/1990	M	3	27.15		7.66	
2-JMS104.16	9/6/1990	M	5	26.89		7.38	
2-JMS104.16	9/6/1990	M	7	26.79		7.24	
2-JMS104.16	9/6/1990	B	8	26.8	7.39	7.24	
2-JMS104.16	9/24/1990	S	1	22.03	7.62	9.18	
2-JMS104.16	9/24/1990	M	3	21.53		8.01	
2-JMS104.16	9/24/1990	M	5	21.43		7.92	
2-JMS104.16	9/24/1990	B	7	21.43	7.49	8.16	
2-JMS104.16	10/9/1990	S	1	23.61	7.24	8.31	
2-JMS104.16	10/9/1990	M	3	22.97		7.88	
2-JMS104.16	10/9/1990	M	5	22.83		7.67	
2-JMS104.16	10/9/1990	M	7	22.82		7.53	
2-JMS104.16	10/9/1990	B	8	22.73	7.23	7.46	
2-JMS104.16	10/25/1990	S	1	15.92	7.31	9.31	
2-JMS104.16	10/25/1990	M	3	15.92		9.3	
2-JMS104.16	10/25/1990	M	5	15.92		9.28	
2-JMS104.16	10/25/1990	M	7	15.93		9.27	
2-JMS104.16	10/25/1990	B	9	15.94	7.38	9.27	
2-JMS104.16	11/7/1990	S	1	14.72	7.2	9.76	
2-JMS104.16	11/7/1990	M	3	14.66		9.79	
2-JMS104.16	11/7/1990	M	5	14.51		9.86	
2-JMS104.16	11/7/1990	B	7	14.38	7.17	9.88	
2-JMS104.16	12/12/1990	S	1	6.41	7.08	12.83	
2-JMS104.16	12/12/1990	M	3	6.41		12.89	
2-JMS104.16	12/12/1990	M	5	6.43		12.98	
2-JMS104.16	12/12/1990	B	7	6.46	7.04	13.02	
2-JMS104.16	1/14/1991	S	1	6.43	7.04	12.06	
2-JMS104.16	1/14/1991	M	3	6.43		12.22	
2-JMS104.16	1/14/1991	B	9	6.43	7.03	12.11	
2-JMS104.16	2/25/1991	S	1	6.98	7.27	12.32	
2-JMS104.16	2/25/1991	M	3	6.98		12.39	
2-JMS104.16	2/25/1991	M	5	6.95		12.4	
2-JMS104.16	2/25/1991	B	7	6.96	7.29	12.5	
2-JMS104.16	3/6/1991	S	1	10.04	7.16	11.18	
2-JMS104.16	3/6/1991	M	3	10.04		11.14	
2-JMS104.16	3/6/1991	M	5	10.04		11.14	
2-JMS104.16	3/6/1991	M	7	10.05		11.19	
2-JMS104.16	3/6/1991	B	8	10.04	7.18	11.18	
2-JMS104.16	3/20/1991	S	1	10.62	6.99	11	
2-JMS104.16	3/20/1991	M	3	10.61		10.99	
2-JMS104.16	3/20/1991	M	5	10.63		10.99	
2-JMS104.16	3/20/1991	B	7	10.63	7.01	10.99	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	4/3/1991	S	1	12.09	6.9	11.2	
2-JMS104.16	4/3/1991	M	3	12.07		11.21	
2-JMS104.16	4/3/1991	M	5	12.09		11.25	
2-JMS104.16	4/3/1991	B	7	12.09	6.87	11.37	
2-JMS104.16	4/23/1991	S	1	14.12	7.06	10.53	
2-JMS104.16	4/23/1991	M	3	13.96		10.51	
2-JMS104.16	4/23/1991	M	5	13.97		10.56	
2-JMS104.16	4/23/1991	B	7	13.97	7.07	10.73	
2-JMS104.16	5/2/1991	S	1	20.52	7.06	8.45	
2-JMS104.16	5/2/1991	M	3	20.44		8.51	
2-JMS104.16	5/2/1991	M	5	20.42		8.51	
2-JMS104.16	5/2/1991	M	7	20.41		8.42	
2-JMS104.16	5/2/1991	B	8	20.41	7.08	8.52	
2-JMS104.16	5/16/1991	S	1	26.73	7.44	6.98	
2-JMS104.16	5/16/1991	M	3	26.93		7.03	
2-JMS104.16	5/16/1991	M	5	26.38		7.03	
2-JMS104.16	5/16/1991	B	6	26.14	7.38	7.15	
2-JMS104.16	6/13/1991	S	1	26.96	7.32	7.22	
2-JMS104.16	6/13/1991	M	3	26.92		7.12	
2-JMS104.16	6/13/1991	M	5	26.8		7.05	
2-JMS104.16	6/13/1991	M	7	26.79		7.05	
2-JMS104.16	6/13/1991	B	8	26.77	7.36	7.06	
2-JMS104.16	6/27/1991	S	1	26.37	7.18	7.2	
2-JMS104.16	6/27/1991	M	3	26.2		7.09	
2-JMS104.16	6/27/1991	M	5	26.2		7.16	
2-JMS104.16	6/27/1991	B	7	26.18	7.19	7.2	
2-JMS104.16	7/16/1991	S	1	29.16	7.15	6.31	
2-JMS104.16	7/16/1991	M	3	29.07		6.33	
2-JMS104.16	7/16/1991	M	5	28.88		6.29	
2-JMS104.16	7/16/1991	B	7	28.88	7.17	6.45	
2-JMS104.16	7/30/1991	S	1	24.27	6.85	7.47	
2-JMS104.16	7/30/1991	M	3	24.26		7.51	
2-JMS104.16	7/30/1991	M	5	24.26		7.54	
2-JMS104.16	7/30/1991	B	6	24.25	6.67	7.72	
2-JMS104.16	8/13/1991	S	1	26.75		7.64	
2-JMS104.16	8/13/1991	M	3	26.49		7.71	
2-JMS104.16	8/13/1991	M	5	26.39		7.79	
2-JMS104.16	8/13/1991	B	7	26.39		7.81	
2-JMS104.16	8/27/1991	S	1	27.32	7.31	6.85	
2-JMS104.16	8/27/1991	M	3	26.98		6.87	
2-JMS104.16	8/27/1991	M	5	26.79		6.88	
2-JMS104.16	8/27/1991	M	7	26.55		6.86	
2-JMS104.16	8/27/1991	B	8	26.45	7.27	7.06	
2-JMS104.16	9/12/1991	S	1	27.08		8.95	
2-JMS104.16	9/12/1991	M	3	26.89		8.95	
2-JMS104.16	9/12/1991	M	5	26.64		8.55	
2-JMS104.16	9/12/1991	M	7	26.57		8.55	
2-JMS104.16	9/12/1991	B	8	26.53		8.68	
2-JMS104.16	10/1/1991	S	1	21.52	7.38	7.88	
2-JMS104.16	10/1/1991	M	3	21.68		7.94	
2-JMS104.16	10/1/1991	M	5	21.56		7.9	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	10/1/1991	B	7	21.54	7.39	7.9	
2-JMS104.16	10/10/1991	S	1	19.55	7.55	8.74	
2-JMS104.16	10/10/1991	M	3	19.4		8.75	
2-JMS104.16	10/10/1991	M	5	19.32		9.11	
2-JMS104.16	10/10/1991	B	7	19.18		9.1	
2-JMS104.16	10/28/1991	S	1	18.81	7.1	8.55	
2-JMS104.16	10/28/1991	M	3	18.79		8.65	
2-JMS104.16	10/28/1991	M	5	18.71		8.76	
2-JMS104.16	10/28/1991	B	7	18.64	7.12	8.88	
2-JMS104.16	11/18/1991	S	1	10.92	7.29	10.36	
2-JMS104.16	11/18/1991	M	3	10.92		10.53	
2-JMS104.16	11/18/1991	M	5	10.93		10.87	
2-JMS104.16	11/18/1991	M	7	10.9		11.04	
2-JMS104.16	11/18/1991	B	8	10.81	7.31	11.26	
2-JMS104.16	12/11/1991	S	1	9.71	7.23	10.97	
2-JMS104.16	12/11/1991	M	3	9.71		10.97	
2-JMS104.16	12/11/1991	M	5	9.71		10.93	
2-JMS104.16	12/11/1991	M	7	9.71		11.37	
2-JMS104.16	12/11/1991	B	9	9.68	7.38	11.37	
2-JMS104.16	1/9/1992	S	1	7.13	7.04	12.98	
2-JMS104.16	1/9/1992	M	3	7.13		13.6	
2-JMS104.16	1/9/1992	M	5	7.14		13.55	
2-JMS104.16	1/9/1992	B	7	7.13	7.09	13.49	
2-JMS104.16	2/10/1992	S	1	5.05	8.26	13.64	
2-JMS104.16	2/10/1992	M	3	5.05		13.76	
2-JMS104.16	2/10/1992	M	5	5.02		13.73	
2-JMS104.16	2/10/1992	B	7	5.03	8.24	13.67	
2-JMS104.16	3/24/1992	S	1	8.81	7.24	11.9	
2-JMS104.16	3/24/1992	M	3	8.77		12.4	
2-JMS104.16	3/24/1992	M	5	8.77		12.5	
2-JMS104.16	3/24/1992	B	6	8.78	7.23	12.51	
2-JMS104.16	4/7/1992	S	1	11.15	7	10.87	
2-JMS104.16	4/7/1992	M	3	11.15		10.87	
2-JMS104.16	4/7/1992	M	5	11.16		10.95	
2-JMS104.16	4/7/1992	B	7	11.19	6.94	11.02	
2-JMS104.16	4/21/1992	S	1	20.03	7.92	8.43	
2-JMS104.16	4/21/1992	M	3	19.98		8.45	
2-JMS104.16	4/21/1992	M	5	19.94		8.44	
2-JMS104.16	4/21/1992	B	7	19.93	7.8	8.45	
2-JMS104.16	5/6/1992	S	1	17.87	7.42	8.96	
2-JMS104.16	5/6/1992	M	3	17.83		8.94	
2-JMS104.16	5/6/1992	M	5	17.74		8.95	
2-JMS104.16	5/6/1992	B	6	17.73	7.2	8.96	
2-JMS104.16	5/27/1992	S	1	19.05	7.39	8.66	
2-JMS104.16	5/27/1992	M	3	18.86		8.7	
2-JMS104.16	5/27/1992	M	5	18.76		8.7	
2-JMS104.16	5/27/1992	M	7	18.71		8.69	
2-JMS104.16	5/27/1992	B	8	18.71	7.29	8.72	
2-JMS104.16	6/18/1992	S	1	22.96	7.44	8.06	
2-JMS104.16	6/18/1992	M	3	22.93		8.08	
2-JMS104.16	6/18/1992	M	5	22.82		8.08	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	6/18/1992	B	7	22.7	7.34	8.08	
2-JMS104.16	7/6/1992	S	1	27.17	7.46	7.36	
2-JMS104.16	7/6/1992	M	3	26.84		7.22	
2-JMS104.16	7/6/1992	M	5	26.8		7.3	
2-JMS104.16	7/6/1992	B	6	26.8	7.46	7.32	
2-JMS104.16	7/20/1992	S	1	30.6	7.75	7.9	
2-JMS104.16	7/20/1992	M	3	29.9		7.35	
2-JMS104.16	7/20/1992	M	5	29.82		7.59	
2-JMS104.16	7/20/1992	B	7	29.51	7.17	7.21	
2-JMS104.16	9/1/1992	S	1	26.72	7.55	7.97	
2-JMS104.16	9/1/1992	M	3	26.13		7.46	
2-JMS104.16	9/1/1992	M	5	26.07		7.39	
2-JMS104.16	9/1/1992	B	7	26.02	7.3	7.48	
2-JMS104.16	10/8/1992	S	1	17.36	7.62	9.13	
2-JMS104.16	10/8/1992	M	3	17.24		9.19	
2-JMS104.16	10/8/1992	M	5	17		9.3	
2-JMS104.16	10/8/1992	M	7	16.85		9.6	
2-JMS104.16	10/8/1992	B	9	16.81	7.49	9.91	
2-JMS104.16	11/2/1992	S	1	14.37	7.13	9.8	
2-JMS104.16	11/2/1992	M	3	14.24		9.83	
2-JMS104.16	11/2/1992	M	5	14.17		9.82	
2-JMS104.16	11/2/1992	B	7	14.19	7.11	9.94	
2-JMS104.16	11/17/1992	S	1	8.04	7.68	11.9	
2-JMS104.16	11/17/1992	M	3	7.97		11.93	
2-JMS104.16	11/17/1992	M	5	7.98		11.92	
2-JMS104.16	11/17/1992	B	7	7.97	7.74	11.9	
2-JMS104.16	12/15/1992	S	1	5.09	7.27	12.93	
2-JMS104.16	12/15/1992	M	3	5.11		12.93	
2-JMS104.16	12/15/1992	M	5	5.1		12.93	
2-JMS104.16	12/15/1992	M	7	5.1		13	
2-JMS104.16	12/15/1992	B	8	5.1	7.18	13.06	
2-JMS104.16	1/14/1993	S	1	6.66	7.42	12.35	
2-JMS104.16	1/14/1993	M	3	6.66		12.42	
2-JMS104.16	1/14/1993	M	5	6.65		12.42	
2-JMS104.16	1/14/1993	B	7	6.65	7.2	12.49	
2-JMS104.16	2/9/1993	S	1	5.45	7.52	13.32	
2-JMS104.16	2/9/1993	M	3	5.3		13.34	
2-JMS104.16	2/9/1993	M	5	5.21		13.38	
2-JMS104.16	2/9/1993	M	7	5.13		13.36	
2-JMS104.16	2/9/1993	B	8	5.13	7.38	13.43	
2-JMS104.16	3/10/1993	S	1	7.76	7.3	11.99	
2-JMS104.16	3/10/1993	M	3	7.76		12	
2-JMS104.16	3/10/1993	M	5	7.76		12	
2-JMS104.16	3/10/1993	B	7	7.76	7.18	12.2	
2-JMS104.16	4/8/1993	S	1	10.83	7.3	11.14	
2-JMS104.16	4/8/1993	M	3	10.83		11.12	
2-JMS104.16	4/8/1993	M	5	10.81		11.13	
2-JMS104.16	4/8/1993	M	7	10.79		11.12	
2-JMS104.16	4/8/1993	B	9	10.81	7.3	11	
2-JMS104.16	4/28/1993	S	1	16.3	7.39	9.86	
2-JMS104.16	4/28/1993	M	3	16.2		9.89	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	4/28/1993	M	5	16.2		9.89	
2-JMS104.16	4/28/1993	B	7	16.2	7.34	9.97	
2-JMS104.16	5/6/1993	S	1	20.56	7.41	9.01	
2-JMS104.16	5/6/1993	M	3	20.5		8.99	
2-JMS104.16	5/6/1993	M	5	20.47		8.87	
2-JMS104.16	5/6/1993	M	7	20.47		8.87	
2-JMS104.16	5/6/1993	B	9	20.48	7.28	8.87	
2-JMS104.16	6/2/1993	S	1	23.92	7.55	7.93	
2-JMS104.16	6/2/1993	M	3	23.57		7.9	
2-JMS104.16	6/2/1993	M	5	23.32		7.94	
2-JMS104.16	6/2/1993	M	7	23.17		7.94	
2-JMS104.16	6/2/1993	B	8	23.13	7.35	7.9	
2-JMS104.16	6/7/1993	S	1	22.94	7.16	8.32	
2-JMS104.16	6/7/1993	M	3	22.86		8.38	
2-JMS104.16	6/7/1993	M	5	22.83		8.37	
2-JMS104.16	6/7/1993	B	7	22.82	7.06	8.44	
2-JMS104.16	6/22/1993	S	1	29.33	7.85	7.17	
2-JMS104.16	6/22/1993	M	3	29.14		7.29	
2-JMS104.16	6/22/1993	M	5	29.01		7.51	
2-JMS104.16	6/22/1993	B	6	28.84	7.42	7.55	
2-JMS104.16	7/7/1993	S	1	31.39	7.63	6.62	
2-JMS104.16	7/7/1993	M	3	30.96		6.52	
2-JMS104.16	7/7/1993	M	5	30.88		6.41	
2-JMS104.16	7/7/1993	B	7	30.62	7.45	6.62	
2-JMS104.16	7/21/1993	S	1	30.72	7.52	6.92	
2-JMS104.16	7/21/1993	M	3	29.92		6.7	
2-JMS104.16	7/21/1993	M	5	29.62		6.52	
2-JMS104.16	7/21/1993	M	7	29.45	7.27	6.36	
2-JMS104.16	8/4/1993	S	1	29.57	7.84	7.75	
2-JMS104.16	8/4/1993	M	3	29.2		7.33	
2-JMS104.16	8/4/1993	M	5	29.16		7.3	
2-JMS104.16	8/4/1993	M	7	29.11	7.58	7.3	
2-JMS104.16	8/18/1993	S	1	29.52	7.51	7.17	
2-JMS104.16	8/18/1993	M	3	29.11		6.99	
2-JMS104.16	8/18/1993	M	5	29		6.98	
2-JMS104.16	8/18/1993	B	7	28.9	7.38	6.98	
2-JMS104.16	9/2/1993	S	1	30.35	7.6	7	
2-JMS104.16	9/2/1993	M	3	29.96		6.7	
2-JMS104.16	9/2/1993	M	5	29.7		6.46	
2-JMS104.16	9/2/1993	B	6	29.69	7.44	6.55	
2-JMS104.16	9/20/1993	S	1	24.58	7.58	7.44	
2-JMS104.16	9/20/1993	M	3	24.27		7.15	
2-JMS104.16	9/20/1993	M	5	24.24		7.13	
2-JMS104.16	9/20/1993	M	7	24.25		7.16	
2-JMS104.16	9/20/1993	B	8	24.25	7.5	7.18	
2-JMS104.16	10/5/1993	S	1	19.78	8.49	8.9	
2-JMS104.16	10/5/1993	M	3	19.69		8.83	
2-JMS104.16	10/5/1993	M	5	19.61		8.83	
2-JMS104.16	10/5/1993	M	6	19.53	8.39	8.79	
2-JMS104.16	12/2/1993	M	1	7.94	7.17	11.95	
2-JMS104.16	12/2/1993	M	3	7.79		11.95	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	12/2/1993	M	5	7.78		12.01	
2-JMS104.16	12/2/1993	M	7	7.79		12.06	
2-JMS104.16	12/2/1993	B	8	7.79	7.2	12.08	
2-JMS104.16	2/17/1994	S	1	4.72	7.42	13.09	
2-JMS104.16	2/17/1994	M	3	4.74		13.15	
2-JMS104.16	2/17/1994	M	5	4.71		13.21	
2-JMS104.16	2/17/1994	M	7	4.72		13.28	
2-JMS104.16	2/17/1994	B	8	4.71	7.42	13.35	
2-JMS104.16	3/21/1994	S	1	9.73	7.6	11.16	
2-JMS104.16	3/21/1994	M	3	9.72		11.13	
2-JMS104.16	3/21/1994	M	5	9.73		11.13	
2-JMS104.16	3/21/1994	B	7	9.73	7.61	11.19	
2-JMS104.16	4/14/1994	S	1	16.72	7.82	9.89	
2-JMS104.16	4/14/1994	M	3	16.55		9.9	
2-JMS104.16	4/14/1994	M	5	9.9		9.9	
2-JMS104.16	4/14/1994	M	7	16.43		9.88	
2-JMS104.16	4/14/1994	B	8	16.38	7.7	9.91	
2-JMS104.16	5/23/1994	S	1	21.1	9.09	9.84	
2-JMS104.16	5/23/1994	M	3	20.51		8.67	
2-JMS104.16	5/23/1994	M	5	20.27		7.9	
2-JMS104.16	5/23/1994	M	7	20.17		7.84	
2-JMS104.16	5/23/1994	B	9	20.03	8.59	7.59	
2-JMS104.16	6/9/1994	S	1	26.75	8	8.55	
2-JMS104.16	6/9/1994	M	3	26.3		7.57	
2-JMS104.16	6/9/1994	M	5	25.98		6.69	
2-JMS104.16	6/9/1994	M	7	25.81		6.74	
2-JMS104.16	6/9/1994	B	9	25.68	7.45	6.73	
2-JMS104.16	7/7/1994	S	1	31.87	7.59	7.75	
2-JMS104.16	7/7/1994	M	3	30.6		6.91	
2-JMS104.16	7/7/1994	M	5	30.16		6.4	
2-JMS104.16	7/7/1994	M	7	30.04		6.26	
2-JMS104.16	7/7/1994	B	9	29.96	7.25	6.05	
2-JMS104.16	8/11/1994	S	1	28.4	8.16	8.7	
2-JMS104.16	8/11/1994	M	3	27.56		8.18	
2-JMS104.16	8/11/1994	M	5	27.35		8.2	
2-JMS104.16	8/11/1994	M	7	27.22		8.11	
2-JMS104.16	8/11/1994	B	8	26.99	7.67	7.8	
2-JMS104.16	9/8/1994	S	9	24.03	7.86	7.6	
2-JMS104.16	9/8/1994	S	1	25.48	8.12	8.03	
2-JMS104.16	9/8/1994	M	3	24.4		7.73	
2-JMS104.16	9/8/1994	M	5	24.19		7.76	
2-JMS104.16	9/8/1994	B	7	24.03		7.65	
2-JMS104.16	10/17/1994	S	9	15.79	8	9.27	
2-JMS104.16	10/17/1994	S	1	16.98	8.42	10.81	
2-JMS104.16	10/17/1994	M	3	16.52		9.76	
2-JMS104.16	10/17/1994	M	5	16.01		9.43	
2-JMS104.16	10/17/1994	B	7	15.96		9.38	
2-JMS104.16	11/30/1994	S	8	8.66	7.7	11.76	
2-JMS104.16	11/30/1994	S	1	9.05	7.67	11.71	
2-JMS104.16	11/30/1994	M	3	8.89		11.7	
2-JMS104.16	11/30/1994	M	5	8.91		11.71	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	11/30/1994	B	7	8.69		11.75	
2-JMS104.16	12/6/1994	S	8	9.79	7.55	10.92	
2-JMS104.16	12/6/1994	S	1	9.97	7.56	10.94	
2-JMS104.16	12/6/1994	M	3	9.96		10.96	
2-JMS104.16	12/6/1994	M	5	9.89		10.92	
2-JMS104.16	12/6/1994	B	7	9.81		10.91	
2-JMS104.16	1/25/1995	S	9	5.14	7.6	12.98	
2-JMS104.16	1/25/1995	S	1	5.15	7.65	12.95	
2-JMS104.16	1/25/1995	M	3	5.16		12.96	
2-JMS104.16	1/25/1995	M	5	5.15		12.97	
2-JMS104.16	1/25/1995	B	7	5.14		12.96	
2-JMS104.16	2/27/1995	S	1	8.19	7.72	11.78	
2-JMS104.16	2/27/1995	M	3	7.94		11.74	
2-JMS104.16	2/27/1995	M	5	7.96		11.72	
2-JMS104.16	2/27/1995	B	7	7.99		11.72	
2-JMS104.16	2/27/1995	S	9	8.02	7.67	11.72	
2-JMS104.16	3/23/1995	S	1	13.75	7.64	10.28	
2-JMS104.16	3/23/1995	M	3	13.7		10.27	
2-JMS104.16	3/23/1995	M	5	13.62		10.28	
2-JMS104.16	3/23/1995	B	7	13.67		10.28	
2-JMS104.16	3/23/1995	S	8	13.65	7.62	10.28	
2-JMS104.16	4/18/1995	S	1	16.6	7.71	9.15	
2-JMS104.16	4/18/1995	M	3	16.3		9.11	
2-JMS104.16	4/18/1995	B	5	16.25		9.11	
2-JMS104.16	4/18/1995	S	7	16.23	7.68	9.06	
2-JMS104.16	5/23/1995	S	1	23.88	7.33	8.02	
2-JMS104.16	5/23/1995	S	8	22.91	7.26	8.17	
2-JMS104.16	6/20/1995	S	1	25.77	7.4	7.72	
2-JMS104.16	6/20/1995	M	3	24.98		7.71	
2-JMS104.16	6/20/1995	B	5	24.87		7.73	
2-JMS104.16	6/20/1995	S	6	24.85	7.26	7.81	
2-JMS104.16	7/18/1995	S	1	31.04	7.66	7.06	
2-JMS104.16	7/18/1995	M	3	30.82		7.03	
2-JMS104.16	7/18/1995	M	5	30.7		6.87	
2-JMS104.16	7/18/1995	B	7	30.71		6.78	
2-JMS104.16	7/18/1995	S	8	30.7	7.49	6.78	
2-JMS104.16	8/23/1995	S	1	29.75	8.33	8.7	
2-JMS104.16	8/23/1995	M	3	29.1		7.84	
2-JMS104.16	8/23/1995	M	5	28.68		7.09	
2-JMS104.16	8/23/1995	B	7	28.65		6.86	
2-JMS104.16	8/23/1995	S	9	28.65	7.74	6.8	
2-JMS104.16	9/21/1995	S	1	23.3	8.22	8.79	
2-JMS104.16	9/21/1995	M	3	22.83		8.06	
2-JMS104.16	9/21/1995	M	5	22.69		7.95	
2-JMS104.16	9/21/1995	B	7	22.51		7.88	
2-JMS104.16	9/21/1995	S	9	22.48	7.8	7.9	
2-JMS104.16	10/19/1995	S	1	17.3	7.31	9.07	
2-JMS104.16	10/19/1995	M	3	16.85		9.27	
2-JMS104.16	10/19/1995	M	5	16.58		9.27	
2-JMS104.16	10/19/1995	M	7	16.36		9.31	
2-JMS104.16	10/19/1995	B	9	16.38	7.34	9.27	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	11/20/1995	S	8	6.4	7.35	12.26	
2-JMS104.16	11/20/1995	S	1	6.4	7.4	12.38	
2-JMS104.16	11/20/1995	M	3	6.37		12.34	
2-JMS104.16	11/20/1995	M	5	6.42		12.27	
2-JMS104.16	11/20/1995	B	7	6.43		12.27	
2-JMS104.16	12/14/1995	S	1	2.8	7.37	13.64	
2-JMS104.16	12/14/1995	M	3	2.77		13.6	
2-JMS104.16	12/14/1995	M	5	2.77		13.58	
2-JMS104.16	12/14/1995	B	7	2.75		13.56	
2-JMS104.16	12/14/1995	S	8	2.75	7.37	13.56	
2-JMS104.16	1/29/1996	S	1	4.36	7.34	13.28	
2-JMS104.16	1/29/1996	M	3	4.36		13.26	
2-JMS104.16	1/29/1996	M	5	4.36		13.28	
2-JMS104.16	1/29/1996	M	7	4.36		13.3	
2-JMS104.16	1/29/1996	B	9	4.35		13.3	
2-JMS104.16	1/29/1996	S	11	4.35	7.26	13.46	
2-JMS104.16	2/20/1996	S	1	4	7.44	13.3	
2-JMS104.16	2/20/1996	M	3	4		13.3	
2-JMS104.16	2/20/1996	M	5	4		13.3	
2-JMS104.16	2/20/1996	B	7	4		13.31	
2-JMS104.16	2/20/1996	S	9	4	7.44	13.29	
2-JMS104.16	3/25/1996	S	1	9.31	7.36	11.8	
2-JMS104.16	3/25/1996	M	3	9.27		11.76	
2-JMS104.16	3/25/1996	B	5	9.27		11.77	
2-JMS104.16	3/25/1996	S	7	9.26	7.34	11.79	
2-JMS104.16	4/29/1996	S	8	19.29	8.19	8.37	
2-JMS104.16	4/29/1996	S	1	19.6	8.44	8.63	
2-JMS104.16	4/29/1996	M	3	19.46		8.52	
2-JMS104.16	4/29/1996	M	5	19.4		8.42	
2-JMS104.16	4/29/1996	B	7	19.27		8.3	
2-JMS104.16	5/15/1996	S	9	18.47	7.57	9.42	
2-JMS104.16	5/15/1996	S	1	18.54	7.78	9.66	
2-JMS104.16	5/15/1996	M	3	18.54		9.58	
2-JMS104.16	5/15/1996	M	5	18.52		9.49	
2-JMS104.16	5/15/1996	B	7	18.48		9.44	
2-JMS104.16	6/18/1996	S	1	26.9	7.46	7.86	
2-JMS104.16	6/18/1996	M	3	26.54		7.73	
2-JMS104.16	6/18/1996	M	5	26.36		7.73	
2-JMS104.16	6/18/1996	B	7	26.36		7.73	
2-JMS104.16	6/18/1996	S	8	26.35	7.38	7.73	
2-JMS104.16	7/23/1996	S	8	27.28	7.36	6.88	
2-JMS104.16	7/23/1996	S	1	27.76	7.6	7.32	
2-JMS104.16	7/23/1996	M	3	27.51		7.26	
2-JMS104.16	7/23/1996	M	5	27.35		7.11	
2-JMS104.16	7/23/1996	B	7	27.29		7	
2-JMS104.16	8/20/1996	S	1	28.12	7.68	7.35	
2-JMS104.16	8/20/1996	M	3	27.7		7.31	
2-JMS104.16	8/20/1996	B	5	27.66		7.31	
2-JMS104.16	8/20/1996	S	7	27.52	7.53	7.27	
2-JMS104.16	9/24/1996	S	8	20.13	7.72	8.79	
2-JMS104.16	9/24/1996	S	1	20.66	7.78	8.75	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	9/24/1996	M	3	20.45		8.78	
2-JMS104.16	9/24/1996	M	5	20.15		8.79	
2-JMS104.16	9/24/1996	B	7	20.13		8.77	
2-JMS104.16	10/22/1996	S	9	14.63	7.3	9.78	
2-JMS104.16	10/22/1996	S	1	15	7.32	9.75	
2-JMS104.16	10/22/1996	M	3	14.88		9.75	
2-JMS104.16	10/22/1996	M	5	14.64		9.77	
2-JMS104.16	10/22/1996	B	7	14.64		9.78	
2-JMS104.16	11/19/1996	S	1	6.45	7.47	12.12	
2-JMS104.16	11/19/1996	M	3	6.45		12.13	
2-JMS104.16	11/19/1996	M	5	6.45		12.13	
2-JMS104.16	11/19/1996	B	7	6.45		12.17	
2-JMS104.16	11/19/1996	S	8	6.43	7.4	12.24	
2-JMS104.16	12/10/1996	S	1	5.21	7.19	12.87	
2-JMS104.16	12/10/1996	M	3	5.19		12.85	
2-JMS104.16	12/10/1996	M	5	5.19		12.82	
2-JMS104.16	12/10/1996	B	7	5.19		12.73	
2-JMS104.16	12/10/1996	S	9	5.19	7.18	12.7	
2-JMS104.16	2/18/1997	S	3	6.14		13.66	
2-JMS104.16	2/18/1997	M	5	6.12		13.66	
2-JMS104.16	2/18/1997	M	7	6.1		13.72	
2-JMS104.16	2/18/1997	B	8	6.1	7.23	13.81	
2-JMS104.16	2/18/1997	S	1	6.14	7.28	13.65	
2-JMS104.16	3/18/1997	S	1	9.72	7.7	11.48	
2-JMS104.16	3/18/1997	M	3	9.74		11.37	
2-JMS104.16	3/18/1997	M	5	9.72		11.4	
2-JMS104.16	3/18/1997	B	7	9.73		11.42	
2-JMS104.16	4/22/1997	S	1	14.08	7.64	9.83	
2-JMS104.16	4/22/1997	M	3	14.04		9.8	
2-JMS104.16	4/22/1997	M	5	14.01		9.8	
2-JMS104.16	4/22/1997	B	7	13.99		9.82	
2-JMS104.16	4/22/1997	S	9	14.01	7.52	9.84	
2-JMS104.16	5/28/1997	S	1	21.99	7.67	7.92	
2-JMS104.16	5/28/1997	M	3	21.5		7.86	
2-JMS104.16	5/28/1997	M	5	20.79		7.76	
2-JMS104.16	5/28/1997	B	7	20.74		7.78	
2-JMS104.16	5/28/1997	S	8	20.72	7.44	7.8	
2-JMS104.16	6/24/1997	S	7	29.21	7.92	6.81	
2-JMS104.16	6/24/1997	S	1	30.2	8.55	7.4	
2-JMS104.16	6/24/1997	M	3	29.75		7.16	
2-JMS104.16	6/24/1997	B	5	29.39		7.05	
2-JMS104.16	7/15/1997	S	1	30.85	8.61		
2-JMS104.16	7/15/1997	S	8	29.24	7.66		
2-JMS104.16	8/19/1997	S	9	30.55	7.57	6.24	
2-JMS104.16	8/19/1997	S	1	30.71	7.71	6.55	
2-JMS104.16	9/23/1997	S	1	24.19	8.31	8.07	
2-JMS104.16	9/23/1997	S	6	23.55	8.27	8.07	
2-JMS104.16	10/21/1997	S	1	15.48	7.85	10.02	
2-JMS104.16	10/21/1997	S	7	14.65	7.74	9.86	
2-JMS104.16	11/18/1997	S	6	7.68	7.52	12.03	
2-JMS104.16	11/18/1997	S	1	7.94	7.56	11.95	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	12/10/1997	S	1	5.67	7.63	12.31	
2-JMS104.16	12/10/1997	M	3	5.67		12.3	
2-JMS104.16	12/10/1997	B	5	5.65		12.28	
2-JMS104.16	12/10/1997	S	8	5.67	7.58	12.28	
2-JMS104.16	1/21/1998	S	1	5.51	7.85	10.78	
2-JMS104.16	1/21/1998	M	3	5.51		10.83	
2-JMS104.16	1/21/1998	M	5	5.51		10.84	
2-JMS104.16	1/21/1998	B	7	5.5		10.95	
2-JMS104.16	1/21/1998	S	8	5.5	7.83	10.98	
2-JMS104.16	3/17/1998	S	9	7.09	7.65	13.03	
2-JMS104.16	3/17/1998	S	1	7.08	7.64	13	
2-JMS104.16	3/17/1998	M	3	7.08		12.99	
2-JMS104.16	3/17/1998	M	5	7.08		12.99	
2-JMS104.16	3/17/1998	B	7	7.08		12.99	
2-JMS104.16	4/21/1998	S	1	14.8	7.49	10.9	
2-JMS104.16	4/21/1998	M	3	14.78		10.9	
2-JMS104.16	4/21/1998	M	5	14.77		10.9	
2-JMS104.16	4/21/1998	B	7	14.78		10.9	
2-JMS104.16	4/21/1998	S	9	14.78	7.48	10.9	
2-JMS104.16	5/19/1998	S	7	23.02	7.82	8.61	
2-JMS104.16	5/19/1998	S	1	23.18	7.91	8.78	
2-JMS104.16	5/19/1998	M	3	23.08		8.68	
2-JMS104.16	5/19/1998	B	5	23.04		8.62	
2-JMS104.16	6/23/1998	S	1	28.14	8.05	7.83	
2-JMS104.16	6/23/1998	M	3	27.94		7.5	
2-JMS104.16	6/23/1998	M	5	27.77		7.29	
2-JMS104.16	6/23/1998	B	7	27.73		7.14	
2-JMS104.16	6/23/1998	S	9	27.72	7.79	7.11	
2-JMS104.16	7/21/1998	S	1	31.4	8.26	7.89	
2-JMS104.16	7/21/1998	M	3	30.55		7.32	
2-JMS104.16	7/21/1998	B	5	30.04		6.91	
2-JMS104.16	7/21/1998	S	7	29.9	8.07	6.84	
2-JMS104.16	8/18/1998	S	8	27.89	7.71	7.21	
2-JMS104.16	8/18/1998	S	1	28.81	7.89	7.5	
2-JMS104.16	8/18/1998	M	3	28.13		7.45	
2-JMS104.16	8/18/1998	M	5	27.98		7.35	
2-JMS104.16	8/18/1998	B	7	27.9		7.21	
2-JMS104.16	9/22/1998	S	1	27.7	7.86	6.92	
2-JMS104.16	9/22/1998	M	3	27.5		6.88	
2-JMS104.16	9/22/1998	M	5	27.31		6.63	
2-JMS104.16	9/22/1998	B	7	27.15		6.72	
2-JMS104.16	9/22/1998	S	9	27.12	7.85	6.75	
2-JMS104.16	10/20/1998	S	8	19.15	7.87	8.67	
2-JMS104.16	10/20/1998	S	1	19.46	7.87	8.64	
2-JMS104.16	10/20/1998	M	3	19.3		8.68	
2-JMS104.16	10/20/1998	M	5	19.24		8.66	
2-JMS104.16	10/20/1998	B	7	19.2		8.63	
2-JMS104.16	11/18/1998	S	9	12.54	7.6	10.64	
2-JMS104.16	11/18/1998	S	1	12.62	7.72	10.73	
2-JMS104.16	11/18/1998	M	3	12.57		10.72	
2-JMS104.16	11/18/1998	M	5	12.54		10.68	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	11/18/1998	B	7	12.54		10.64	
2-JMS104.16	12/15/1998	S	9	8.77	7.23	12.49	
2-JMS104.16	12/15/1998	S	1	8.77	7.28	12.33	
2-JMS104.16	12/15/1998	M	3	8.77		12.37	
2-JMS104.16	12/15/1998	M	5	8.77		12.37	
2-JMS104.16	12/15/1998	B	7	8.77		12.42	
2-JMS104.16	1/19/1999	S	1	5.4	7.35	12.59	
2-JMS104.16	1/19/1999	M	3	5.39		12.62	
2-JMS104.16	1/19/1999	M	5	5.4		12.63	
2-JMS104.16	1/19/1999	M	7	5.4		12.61	
2-JMS104.16	1/19/1999	B	9	5.38	7.35	12.58	
2-JMS104.16	2/23/1999	S	1	5.61	7.29	12.51	
2-JMS104.16	2/23/1999	M	3	5.54		12.51	
2-JMS104.16	2/23/1999	M	5	5.49		12.52	
2-JMS104.16	2/23/1999	B	7	5.48	7.21	12.4	
2-JMS104.16	3/23/1999	S	1	9.73	7.18	11.08	
2-JMS104.16	3/23/1999	M	3	9.72		11.16	
2-JMS104.16	3/23/1999	M	5	9.71		11.3	
2-JMS104.16	3/23/1999	B	7	9.71	7.11	11.1	
2-JMS104.16	4/20/1999	B	8	16.49	8.05	8.76	
2-JMS104.16	4/20/1999	S	1	16.75	8.37	8.88	
2-JMS104.16	4/20/1999	M	3	16.59		8.79	
2-JMS104.16	4/20/1999	M	5	16.54		8.78	
2-JMS104.16	4/20/1999	M	7	16.53		8.79	
2-JMS104.16	5/20/1999	B	7	20.6	7.46	8.35	
2-JMS104.16	5/20/1999	S	1	21.19	7.48	8.39	
2-JMS104.16	5/20/1999	M	3	20.62		8.36	
2-JMS104.16	5/20/1999	M	5	20.6		8.35	
2-JMS104.16	6/22/1999	B	8	22.35	7.3	8.03	
2-JMS104.16	6/22/1999	S	1	22.85	7.37	7.82	
2-JMS104.16	6/22/1999	M	3	22.62		7.72	
2-JMS104.16	6/22/1999	M	5	22.57		7.6	
2-JMS104.16	6/22/1999	M	7	22.35		7.86	
2-JMS104.16	7/20/1999	S	1	30.3	7.87	8.38	
2-JMS104.16	7/20/1999	M	3	29.55		6.97	
2-JMS104.16	7/20/1999	M	5	29.41		6.78	
2-JMS104.16	7/20/1999	B	6	29.36	7.45	6.71	
2-JMS104.16	8/17/1999	S	1	30.22	8.43	11.3	
2-JMS104.16	8/17/1999	M	3	29.3		8.32	
2-JMS104.16	8/17/1999	M	5	29.14		7.84	
2-JMS104.16	8/17/1999	B	7	29	7.62	7.41	
2-JMS104.16	9/21/1999	S	1	21.57	7.23	8.92	
2-JMS104.16	9/21/1999	M	3	21.5		9.01	
2-JMS104.16	9/21/1999	M	5	21.5		9.01	
2-JMS104.16	9/21/1999	M	7	21.07		8.8	
2-JMS104.16	9/21/1999	B	8	20.88	7.13	8.9	
2-JMS104.16	10/28/1999	B	7	13.17	7.56	9.41	
2-JMS104.16	10/28/1999	S	1	13.64	7.6	9.68	
2-JMS104.16	10/28/1999	M	3	13.41		9.63	
2-JMS104.16	10/28/1999	M	5	13.23		9.65	
2-JMS104.16	11/18/1999	S	1	9.8	7.71	10.27	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	11/18/1999	M	3	9.97		10.59	
2-JMS104.16	11/18/1999	M	5	9.87		10.61	
2-JMS104.16	11/18/1999	B	7	9.85	7.64	10.58	
2-JMS104.16	12/21/1999	M	7	7.16		11.64	
2-JMS104.16	12/21/1999	B	9	7.13	7.43	11.65	
2-JMS104.16	12/21/1999	S	1	7.16	7.45	11.76	
2-JMS104.16	12/21/1999	M	3	7.16		11.67	
2-JMS104.16	12/21/1999	M	5	7.16		11.81	
2-JMS104.16	1/18/2000	B	9	3.39	7.47	13.6	
2-JMS104.16	1/18/2000	S	1	3.35	7.5	13.03	
2-JMS104.16	1/18/2000	M	3	3.35		13.19	
2-JMS104.16	1/18/2000	M	5	3.35		13.28	
2-JMS104.16	1/18/2000	M	7	3.39		13.39	
2-JMS104.16	2/23/2000	B	9	7.25	7.38	11.85	
2-JMS104.16	2/23/2000	S	1	7.33	7.43	11.78	
2-JMS104.16	2/23/2000	M	3	7.34		11.83	
2-JMS104.16	2/23/2000	M	5	7.29		11.82	
2-JMS104.16	2/23/2000	M	7	7.3		11.85	
2-JMS104.16	3/28/2000	B	8	13.98	7.4	9.92	
2-JMS104.16	3/28/2000	S	1	14.05	7.47	9.87	
2-JMS104.16	3/28/2000	M	3	13.98		9.84	
2-JMS104.16	3/28/2000	M	5	13.97		9.85	
2-JMS104.16	3/28/2000	M	7	13.97		9.87	
2-JMS104.16	4/24/2000	B	8	16.57	7.24	9.54	
2-JMS104.16	4/24/2000	S	1	16.67	7.3	9.35	
2-JMS104.16	4/24/2000	M	3	16.6		9.4	
2-JMS104.16	4/24/2000	M	5	16.59		9.4	
2-JMS104.16	4/24/2000	M	7	16.58		9.45	
2-JMS104.16	5/23/2000	B	9	22.2	7.42	7.1	
2-JMS104.16	5/23/2000	S	1	22.33	7.43	6.99	
2-JMS104.16	5/23/2000	M	3	22.29		7.11	
2-JMS104.16	5/23/2000	M	5	22.22		6.6	
2-JMS104.16	5/23/2000	M	7	22.19		7.05	
2-JMS104.16	6/20/2000	B	8	28.2	7.55	6.57	
2-JMS104.16	6/20/2000	S	1	28.74	7.67	7.07	
2-JMS104.16	6/20/2000	M	3	28.39		6.52	
2-JMS104.16	6/20/2000	M	5	28.22		6.67	
2-JMS104.16	6/20/2000	M	7	28.19		6.49	
2-JMS104.16	7/18/2000	B	9	27.96	7.29	6.47	
2-JMS104.16	7/18/2000	S	1	29.08	7.64	7.89	
2-JMS104.16	7/18/2000	M	3	28.48		6.94	
2-JMS104.16	7/18/2000	M	5	28.06		6.67	
2-JMS104.16	7/18/2000	M	7	28.04		6.63	
2-JMS104.16	8/22/2000	B	8	25.82	7.82	7.29	
2-JMS104.16	8/22/2000	S	1	26.38	8.04	7.5	
2-JMS104.16	8/22/2000	M	3	26.38		7.3	
2-JMS104.16	8/22/2000	M	5	25.86		7.21	
2-JMS104.16	8/22/2000	M	7	25.83		7.19	
2-JMS104.16	9/26/2000	B	10	20.47	7.56	8.07	
2-JMS104.16	9/26/2000	S	1	20.52	7.57	7.85	
2-JMS104.16	9/26/2000	M	3	20.52		7.99	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	9/26/2000	M	5	20.52		8.02	
2-JMS104.16	9/26/2000	M	7	20.47		8	
2-JMS104.16	9/26/2000	M	9	20.47		8	
2-JMS104.16	10/24/2000	B	8	18.43	7.66	7.87	
2-JMS104.16	10/24/2000	S	1	19.03	7.67	8.08	
2-JMS104.16	10/24/2000	M	3	18.56		7.98	
2-JMS104.16	10/24/2000	M	5	18.5		7.92	
2-JMS104.16	10/24/2000	M	7	18.45		7.69	
2-JMS104.16	1/23/2001	S	1	2.68	7.05	13.77	
2-JMS104.16	1/23/2001	M	3	2.66		13.76	
2-JMS104.16	1/23/2001	B	5	2.64	7.05	13.73	
2-JMS104.16	2/20/2001	S	1	8.9	7.75	11.58	
2-JMS104.16	2/20/2001	M	3	8.54		11.56	
2-JMS104.16	2/20/2001	M	5	8.26		11.67	
2-JMS104.16	2/20/2001	B	7	8.21	7.69	11.63	
2-JMS104.16	3/27/2001	S	1	9.46	7.08	12.32	
2-JMS104.16	3/27/2001	M	3	9.39		12.33	
2-JMS104.16	3/27/2001	M	5	9.34		12.45	
2-JMS104.16	3/27/2001	M	7	9.34		12.47	
2-JMS104.16	3/27/2001	B	8	9.31	7.08	12.73	
2-JMS104.16	4/24/2001	S	1	21.47	8.6	9.04	
2-JMS104.16	4/24/2001	M	3	21.04		8.57	
2-JMS104.16	4/24/2001	M	5	20.65		7.89	
2-JMS104.16	4/24/2001	B	7	20.69	6.77	6.5	
2-JMS104.16	6/19/2001	S	1	28.56	8.53	8.4	
2-JMS104.16	6/19/2001	M	3	27.98		8.08	
2-JMS104.16	6/19/2001	M	5	27.28		7.84	
2-JMS104.16	6/19/2001	M	7	27.11		7.65	
2-JMS104.16	6/19/2001	B	8	27.07	7.49	7.55	
2-JMS104.16	7/24/2001	S	1	28.2	7.79	7.78	
2-JMS104.16	7/24/2001	M	3	27.62	7.57	7.09	
2-JMS104.16	7/24/2001	M	5	27.53	7.44	7.06	
2-JMS104.16	7/24/2001	B	6	27.47	7.37	6.8	
2-JMS104.16	8/21/2001	S	1	28.78	7.7	6.46	
2-JMS104.16	8/21/2001	M	3	28.69		6.38	
2-JMS104.16	8/21/2001	M	5	28.64		6.66	
2-JMS104.16	8/21/2001	M	7	28.67		6.47	
2-JMS104.16	8/21/2001	B	8	28.61	7.64	6.81	
2-JMS104.16	9/18/2001	S	1	24.35	8.32	8.18	
2-JMS104.16	9/18/2001	M	3	23.46		6.89	
2-JMS104.16	9/18/2001	M	5	23.24		6.94	
2-JMS104.16	9/18/2001	M	7	22.96		7.09	
2-JMS104.16	9/18/2001	B	8	22.8	7.95	7.22	
2-JMS104.16	10/16/2001	S	1	19.51	7.92	9.12	
2-JMS104.16	10/16/2001	M	3	19.38		8.86	
2-JMS104.16	10/16/2001	M	5	19.37		8.88	
2-JMS104.16	10/16/2001	M	7	19.35		8.75	
2-JMS104.16	10/16/2001	B	8	19.33	7.82	8.82	
2-JMS104.16	11/27/2001	S	1	12.42	7.79	10.22	
2-JMS104.16	11/27/2001	M	3	11.77		10.41	
2-JMS104.16	11/27/2001	M	5	11.68		10.56	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	11/27/2001	M	7	11.67		10.63	
2-JMS104.16	11/27/2001	B	8	11.69	7.75	10.84	
2-JMS104.16	12/12/2001	S	1	11.83	7.6	10.09	
2-JMS104.16	12/12/2001	M	3	11.79		10.16	
2-JMS104.16	12/12/2001	M	5	11.72		10.2	
2-JMS104.16	12/12/2001	M	7	11.72		10.32	
2-JMS104.16	12/12/2001	B	9	11.34	7.54	10.55	
2-JMS104.16	1/22/2002	S	1	5.69	7.61	12.63	
2-JMS104.16	1/22/2002	M	3	5.65		12.78	
2-JMS104.16	1/22/2002	M	5	5.63		12.94	
2-JMS104.16	1/22/2002	B	7	5.6	7.45	13.29	
2-JMS104.16	2/19/2002	S	1	8.13	7.78	11.51	
2-JMS104.16	2/19/2002	M	3	7.75		11.22	
2-JMS104.16	2/19/2002	M	5	7.23		11.36	
2-JMS104.16	2/19/2002	B	7	7.23	7.66	12.21	
2-JMS104.16	3/19/2002	S	1	12.8	7.75	9.05	
2-JMS104.16	3/19/2002	M	3	12.8		9.11	
2-JMS104.16	3/19/2002	M	5	12.74		8.97	
2-JMS104.16	3/19/2002	M	7	12.76		9.14	
2-JMS104.16	3/19/2002	B	8	12.69	7.67	9.26	
2-JMS104.16	4/16/2002	S	1	23.5	7.58	7.66	
2-JMS104.16	4/16/2002	M	3	22.69		7.72	
2-JMS104.16	4/16/2002	M	5	22.3		7.73	
2-JMS104.16	4/16/2002	B	7	21.87	7.45	7.77	
2-JMS104.16	5/30/2002	S	1	27.12	7.63	6.67	
2-JMS104.16	5/30/2002	M	3	26.51	7.55	6.43	
2-JMS104.16	5/30/2002	M	5	26.36	7.53	6.47	
2-JMS104.16	5/30/2002	M	7	26.2	7.53	6.33	
2-JMS104.16	5/30/2002	B	8	26.18	7.54	6.21	
2-JMS104.16	6/25/2002	S	1	28.64	7.63		
2-JMS104.16	6/25/2002	M	3	28.57	7.64		
2-JMS104.16	6/25/2002	M	5	28.49	7.52		
2-JMS104.16	6/25/2002	M	7	28.46	7.53		
2-JMS104.16	6/25/2002	B	8	28.4	7.48		
2-JMS104.16	7/23/2002	S	1	30.3	7.57	6.25	
2-JMS104.16	7/23/2002	M	3	30.06	7.49	5.85	
2-JMS104.16	7/23/2002	M	5	29.98	7.48	5.77	
2-JMS104.16	7/23/2002	M	7	29.95	5.74	7.48	
2-JMS104.16	7/23/2002	B	8	29.96	7.48	5.75	
2-JMS104.16	8/13/2002	S	1	29.05	8.29	9.39	
2-JMS104.16	8/13/2002	M	3	28.18	7.95	8.18	
2-JMS104.16	8/13/2002	M	5	28.18	7.78	7.53	
2-JMS104.16	8/13/2002	B	7	28.03	7.72	7.34	
2-JMS104.16	9/24/2002	S	1	26.16	7.75	8.39	
2-JMS104.16	9/24/2002	M	3	26.08	7.41	7.52	
2-JMS104.16	9/24/2002	M	5	25.85	7.41	7.07	
2-JMS104.16	9/24/2002	M	7	25.76	7.38	6.9	
2-JMS104.16	9/24/2002	B	8	25.71	7.36	6.89	
2-JMS104.16	10/22/2002	S	1	16.56	7.93	8.32	
2-JMS104.16	10/22/2002	M	3	16.48	7.92	8.12	
2-JMS104.16	10/22/2002	M	5	16.38	7.91	8.17	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	10/22/2002	M	7	16.37	7.92	8.2	
2-JMS104.16	10/22/2002	B	9	16.27	7.92	8.45	
2-JMS104.16	11/19/2002	S	1	10.23	7.13	12.19	
2-JMS104.16	11/19/2002	M	3	10.23	7.12	11.93	
2-JMS104.16	11/19/2002	M	5	10.23	7.13	11.95	
2-JMS104.16	11/19/2002	M	7	10.22	7.12	12.08	
2-JMS104.16	11/19/2002	B	8	10.23	7.13	12.32	
2-JMS104.16	12/10/2002	S	1	2.45	7.6	14.31	
2-JMS104.16	12/10/2002	M	3	2.46	7.59	14.59	
2-JMS104.16	12/10/2002	M	5	2.45	7.58	14.53	
2-JMS104.16	12/10/2002	B	7	2.46	7.57	15.66	
2-JMS104.16	1/21/2003	S	1	2.2	7.65	14.47	
2-JMS104.16	1/21/2003	M	3	2.2	7.62	14.45	
2-JMS104.16	1/21/2003	M	5	2.2	7.6	14.68	
2-JMS104.16	1/21/2003	M	7	2.2	7.6	14.76	
2-JMS104.16	1/21/2003	B	8	2.19	7.56	15.05	
2-JMS104.16	2/25/2003	S	1	4.62	7.01	13.04	
2-JMS104.16	2/25/2003	M	3	4.61	6.96	13.05	
2-JMS104.16	2/25/2003	M	5	4.6	6.93	13.13	
2-JMS104.16	2/25/2003	M	7	4.6	6.93	13.31	
2-JMS104.16	2/25/2003	M	9	4.61	6.89	13.37	
2-JMS104.16	2/25/2003	B	10	4.61	6.93	13.53	
2-JMS104.16	3/18/2003	S	1	11.57	7.72	10.48	
2-JMS104.16	3/18/2003	M	3	11.5	7.71	10.49	
2-JMS104.16	3/18/2003	M	5	11.4	7.69	10.68	
2-JMS104.16	3/18/2003	M	7	11.32	7.69	10.4	
2-JMS104.16	3/18/2003	B	9	11.29	7.71	10.63	
2-JMS104.16	5/27/2003	S	1	17.19	6.8	9.44	
2-JMS104.16	5/27/2003	M	3	17.17	6.86	9.46	
2-JMS104.16	5/27/2003	M	5	17.17	6.85	9.52	
2-JMS104.16	5/27/2003	M	7	17.17	6.88	9.52	
2-JMS104.16	5/27/2003	B	8	17.17	6.89	9.28	
2-JMS104.16	6/24/2003	S	1	21.53	7.68	8.7	
2-JMS104.16	6/24/2003	M	3	21.4	7.68	8.7	
2-JMS104.16	6/24/2003	M	5	21.38	7.67	8.75	
2-JMS104.16	6/24/2003	M	7	21.4	7.66	8.79	
2-JMS104.16	6/24/2003	B	9	21.41	7.67	8.87	
2-JMS104.16	7/15/2003	S	1	26.69	7.69	8.06	
2-JMS104.16	7/15/2003	M	3	26.57	7.63	8.02	
2-JMS104.16	7/15/2003	M	5	26.44	7.58	7.84	
2-JMS104.16	7/15/2003	M	7	26.41	7.56	7.79	
2-JMS104.16	7/15/2003	B	9	26.41	7.56	7.93	
2-JMS104.16	8/26/2003	S	1	29.41	8.38	7.82	
2-JMS104.16	8/26/2003	M	3	28.86	8.26	7.64	
2-JMS104.16	8/26/2003	M	5	28.35	8.15	7.62	
2-JMS104.16	8/26/2003	M	7	27.96	8.2	7.77	
2-JMS104.16	8/26/2003	B	8	27.64	8.01	7.58	
2-JMS104.16	9/24/2003	S	1	21.03	7.45	12.18	
2-JMS104.16	9/24/2003	M	3	21.03	7.45	12.18	
2-JMS104.16	9/24/2003	M	5	21.03	7.44	12.2	
2-JMS104.16	9/24/2003	B	6	21.01	7.43	12.18	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	10/28/2003	S	1	15.06	7.63	9.41	
2-JMS104.16	10/28/2003	M	3	15.07	7.63	9.46	
2-JMS104.16	10/28/2003	M	5	15.08	7.63	9.37	
2-JMS104.16	10/28/2003	M	7	15.06	7.62	9.65	
2-JMS104.16	10/28/2003	B	8	15.06	7.61	9.98	
2-JMS104.16	11/18/2003	S	1	10.47	7.57	10.33	
2-JMS104.16	11/18/2003	M	3	10.46	7.5	10.32	
2-JMS104.16	11/18/2003	M	5	10.45	7.54	10.32	
2-JMS104.16	11/18/2003	M	7	10.45	7.52	10.38	
2-JMS104.16	11/18/2003	B	9	10.45	7.52	10.49	
2-JMS104.16	12/16/2003	S	1	4.36	7.34	12.57	
2-JMS104.16	12/16/2003	M	3	4.34	7.3	12.69	
2-JMS104.16	12/16/2003	M	5	4.33	7.29	12.53	
2-JMS104.16	12/16/2003	M	7	4.34	7.25	12.38	
2-JMS104.16	12/16/2003	B	9	4.36	7.25	12.49	
2-JMS104.16	2/25/2004	S	1	6.35	7.78	12.55	
2-JMS104.16	2/25/2004	M	3	6.33	7.77	12.59	
2-JMS104.16	2/25/2004	M	5	6.34	7.75	12.76	
2-JMS104.16	2/25/2004	M	7	6.38	7.74	12.81	
2-JMS104.16	2/25/2004	B	8	6.32	7.71	12.64	
2-JMS104.16	3/23/2004	S	1	10.45	7.73	11.3	
2-JMS104.16	3/23/2004	M	3	10.32	7.75	11.27	
2-JMS104.16	3/23/2004	M	5	10.26	7.75	11.36	
2-JMS104.16	3/23/2004	B	7	10.28	7.73	11.44	
2-JMS104.16	4/20/2004	S	1	17.61	7.42	9.45	
2-JMS104.16	4/20/2004	M	3	17.53	7.39	9.49	
2-JMS104.16	4/20/2004	M	5	17.53	7.38	9.49	
2-JMS104.16	4/20/2004	M	7	17.52	7.36	9.51	
2-JMS104.16	4/20/2004	B	8	17.55	7.38	9.68	
2-JMS104.16	5/18/2004	S	1		8.07		
2-JMS104.16	5/18/2004	M	3		7.73		
2-JMS104.16	5/18/2004	M	5		7.58		
2-JMS104.16	5/18/2004	B	7		7.62		
2-JMS104.16	6/15/2004	S	1	25.31	7.41	7.6	
2-JMS104.16	6/15/2004	M	3	24.62	7.39	7.64	
2-JMS104.16	6/15/2004	M	5	24.58	7.4	7.63	
2-JMS104.16	6/15/2004	M	7	24.46	7.39	7.63	
2-JMS104.16	6/15/2004	B	9	24.46	7.4	7.55	
2-JMS104.16	7/20/2004	S	1	28.63	8.38	7.32	
2-JMS104.16	7/20/2004	M	3	28.49	8.3	6.96	
2-JMS104.16	7/20/2004	M	5	28.35	8.27	7.13	
2-JMS104.16	7/20/2004	M	7	28.12	8.19	7.4	
2-JMS104.16	7/20/2004	B	8	28.2	8.21	7.07	
2-JMS104.16	8/17/2004	S	1	25	7.51	6.8	
2-JMS104.16	8/17/2004	M	3	24.6	7.52	6.73	
2-JMS104.16	8/17/2004	M	5	24.3	7.5	7.02	
2-JMS104.16	8/17/2004	M	7	24.1	7.44	7.14	
2-JMS104.16	8/17/2004	B	9	24.2	7.45	7.07	
2-JMS104.16	9/21/2004	S	1	20.73	7.71	8.65	
2-JMS104.16	9/21/2004	M	3	20.55	7.71	8.62	
2-JMS104.16	9/21/2004	M	5	20.51	7.7	8.59	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	9/21/2004	M	7	20.52	7.71	8.71	
2-JMS104.16	9/21/2004	B	9	20.52	7.78	8.63	
2-JMS104.16	10/19/2004	S	1	15.89	7.93	9.26	
2-JMS104.16	10/19/2004	M	3	15.87	7.89	9.29	
2-JMS104.16	10/19/2004	M	5	15.8	7.83	9.38	
2-JMS104.16	10/19/2004	M	7	15.77	7.82	9.4	
2-JMS104.16	10/19/2004	B	8	15.76	7.86	9.44	
2-JMS104.16	11/16/2004	S	1	9.25	7.54	11.34	
2-JMS104.16	11/16/2004	M	3	9.23	7.56	11.28	
2-JMS104.16	11/16/2004	M	5	9.23	7.52	11.4	
2-JMS104.16	11/16/2004	M	7	9.21	7.5	11.37	
2-JMS104.16	11/16/2004	B	8	9.2	7.54	11.4	
2-JMS104.16	12/14/2004	S	1	8.11	7.75	11.53	
2-JMS104.16	12/14/2004	M	3	8.14	7.76	11.6	
2-JMS104.16	12/14/2004	M	5	8.13	7.71	11.61	
2-JMS104.16	12/14/2004	M	7	8.16	7.69	11.65	
2-JMS104.16	12/14/2004	B	9	8.14	7.79	11.64	
2-JMS104.16	1/26/2005	S	1	0.68	7.67	13.88	
2-JMS104.16	1/26/2005	M	3	0.68	7.67	13.89	
2-JMS104.16	1/26/2005	M	5	0.68	7.67	13.92	
2-JMS104.16	1/26/2005	M	7	0.7	7.7	13.99	
2-JMS104.16	1/26/2005	B	9	0.7	7.77	14.15	
2-JMS104.16	2/15/2005	S	1	7.26	7.74	11.62	
2-JMS104.16	2/15/2005	M	3	7.25	7.75	11.7	
2-JMS104.16	2/15/2005	M	5	7.25	7.73	11.68	
2-JMS104.16	2/15/2005	M	7	7.26	7.75	11.74	
2-JMS104.16	2/15/2005	B	8	7.2	7.79	12	
2-JMS104.16	3/22/2005	S	1	10.57	7.72	10.99	
2-JMS104.16	3/22/2005	M	3	10.34	7.71	10.95	
2-JMS104.16	3/22/2005	M	5	10.31	7.71	10.9	
2-JMS104.16	3/22/2005	M	7	10.31	7.73	10.81	
2-JMS104.16	3/22/2005	B	8	10.31	7.76	10.87	
2-JMS104.16	4/19/2005	S	1	16.3	7.6	9.18	
2-JMS104.16	4/19/2005	M	3	16.3	7.58	9.2	
2-JMS104.16	4/19/2005	M	5	16.2	7.6	9.33	
2-JMS104.16	4/19/2005	M	7	16.2	7.6	9.3	
2-JMS104.16	4/19/2005	B	8	16.2	7.62	9.26	
2-JMS104.16	5/24/2005	S	1	20	7.45	7.94	
2-JMS104.16	5/24/2005	M	3	19.99	7.42	8	
2-JMS104.16	5/24/2005	M	5	19.98	7.41	7.98	
2-JMS104.16	5/24/2005	M	7	19.99	7.52	8.07	
2-JMS104.16	5/24/2005	B	9	19.99	7.6	8.12	
2-JMS104.16	6/21/2005	S	1	26.9	7.81	7.55	
2-JMS104.16	6/21/2005	M	3	25.9	7.68	7.34	
2-JMS104.16	6/21/2005	M	5	25.5	7.55	7.22	
2-JMS104.16	6/21/2005	M	7	25.1	7.44	7.22	
2-JMS104.16	6/21/2005	B	9	25	7.48	7.24	
2-JMS104.16	7/19/2005	S	1	33.12	7.86	7.24	
2-JMS104.16	7/19/2005	M	3	31.26	7.54	6.67	
2-JMS104.16	7/19/2005	M	5	30.81	7.43	6.61	
2-JMS104.16	7/19/2005	M	7	30.82	7.45	6.63	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	7/19/2005	B	8	30.82	7.47	6.57	
2-JMS104.16	8/23/2005	S	1	29.8	7.7	6.66	
2-JMS104.16	8/23/2005	M	3	29.7	7.68	6.62	
2-JMS104.16	8/23/2005	M	5	29.6	7.7	6.66	
2-JMS104.16	8/23/2005	M	7	29.6	7.64	6.61	
2-JMS104.16	8/23/2005	B	9	29.6	7.62	6.6	
2-JMS104.16	9/20/2005	S	1	28.1	7.9	7.06	
2-JMS104.16	9/20/2005	M	3	27.9	7.82	6.83	
2-JMS104.16	9/20/2005	M	5	27.9	7.78	6.83	
2-JMS104.16	9/20/2005	B	7	27.9	7.77	6.8	
2-JMS104.16	10/18/2005	S	1	18.9	7.72	8.76	
2-JMS104.16	10/18/2005	M	3	18.8	7.66	8.25	
2-JMS104.16	10/18/2005	M	5	18.8	7.31	6.04	
2-JMS104.16	10/18/2005	B	6	18.8	7.3	5.49	
2-JMS104.16	11/15/2005	S	0.3		7.77	9.78	
2-JMS104.16	11/15/2005	S	1	14.6	7.77	9.78	
2-JMS104.16	11/15/2005	M	3	14.5	7.76	9.75	
2-JMS104.16	11/15/2005	M	5	14.38	7.78	9.8	
2-JMS104.16	11/15/2005	M	7	14.2	7.81	9.76	
2-JMS104.16	11/15/2005	B	9	14.3	7.88	9.78	
2-JMS104.16	12/13/2005	S	1	3.85	7.17	12.93	
2-JMS104.16	12/21/2005	S	1	2.9	7.56	13.36	
2-JMS104.16	12/21/2005	M	3	2.9	7.55	13.35	
2-JMS104.16	12/21/2005	M	5	2.9	7.54	13.29	
2-JMS104.16	12/21/2005	M	7	2.9	7.52	13.34	
2-JMS104.16	12/21/2005	B	8	2.8	7.49	13.56	
2-JMS104.16	1/17/2006	S	1	5.9	7.54	12.57	
2-JMS104.16	1/17/2006	M	3	5.9	7.52	12.59	
2-JMS104.16	1/17/2006	M	5	5.8	7.39	12.61	
2-JMS104.16	1/17/2006	M	7	5.8	7.32	12.54	
2-JMS104.16	1/17/2006	B	8	5.8	7.33	12.79	
2-JMS104.16	2/21/2006	S	1	6	7.21	12.4	
2-JMS104.16	2/21/2006	M	3	6.03	7.1	12.44	
2-JMS104.16	2/21/2006	M	5	6.32	7.2	12.43	
2-JMS104.16	2/21/2006	M	7	6.21	7.1	12.5	
2-JMS104.16	2/21/2006	B	8	6.1	7.11	12.61	
2-JMS104.16	3/20/2006	S	1	12.9	8.1	10.2	
2-JMS104.16	3/20/2006	M	3	12.9	8.1	10.2	
2-JMS104.16	3/20/2006	M	5	12.8	8.1	10.3	
2-JMS104.16	3/20/2006	B	7	12.6	8	10.3	
2-JMS104.16	4/26/2006	S	1	19.9	7.6	8	
2-JMS104.16	4/26/2006	M	3	19.8	7.6	8.1	
2-JMS104.16	4/26/2006	M	5	19.8	7.6	8	
2-JMS104.16	4/26/2006	M	7	19.8	7.6	8.1	
2-JMS104.16	4/26/2006	B	9	19.8	7.6	8.1	
2-JMS104.16	5/15/2006	S	1	20.6	7.6	7.7	
2-JMS104.16	5/15/2006	M	3	20	7.6	7.7	
2-JMS104.16	5/15/2006	M	5	19.9	7.6	7.7	
2-JMS104.16	5/15/2006	M	7	19.9	7.6	7.6	
2-JMS104.16	5/15/2006	B	8	19.9	7.6	7.6	
2-JMS104.16	6/21/2006	S	0.3	28.4	7.8	7	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	7/24/2006	S	1	29.8	7.9	6.9	
2-JMS104.16	7/24/2006	M	3	29.2	7.9	6.8	
2-JMS104.16	7/24/2006	M	5	28.6	7.6	6.4	
2-JMS104.16	7/24/2006	M	7	28.5	7.6	6.4	
2-JMS104.16	7/24/2006	B	9	28.4	7.6	6.4	
2-JMS104.16	8/22/2006	S	1	28.8	7.9	7.3	
2-JMS104.16	8/22/2006	M	3	28.8	7.9	7.3	
2-JMS104.16	8/22/2006	M	5	28.8	7.9	7.3	
2-JMS104.16	8/22/2006	M	7	28.8	7.9	7.2	
2-JMS104.16	8/22/2006	B	8	28.8	7.8	7	
2-JMS104.16	9/27/2006	S	1	22.5	8.1	8.7	
2-JMS104.16	10/30/2006	S	1	12.2	7.5	10.2	
2-JMS104.16	10/30/2006	M	3	12.1	7.5	10.2	
2-JMS104.16	10/30/2006	M	5	12.1	7.5	10.3	
2-JMS104.16	10/30/2006	B	7	12.1	7.5	10.4	
2-JMS104.16	11/15/2006	S	1	12.7	7.4	9.8	
2-JMS104.16	11/15/2006	M	3	12.7	7.4	9.8	
2-JMS104.16	11/15/2006	M	5	12.7	7.4	9.9	
2-JMS104.16	11/15/2006	M	7	12.7	7.4	9.8	
2-JMS104.16	11/15/2006	B	9	12.7	7.4	10	
2-JMS104.16	12/18/2006	S	1	8.1	7.3	12	
2-JMS104.16	1/24/2007	S	1	4.3	7.8	12.4	
2-JMS104.16	1/24/2007	M	3	4.2	7.8	12.4	
2-JMS104.16	1/24/2007	M	5	4.2	7.8	12.5	
2-JMS104.16	1/24/2007	B	7	4.2	7.8	12.6	
2-JMS104.16	2/20/2007	S	1	2.4	7.2	13.4	
2-JMS104.16	2/20/2007	M	3	2.4	7.2	13.4	
2-JMS104.16	2/20/2007	M	5	2.4	7.1	13.4	
2-JMS104.16	2/20/2007	B	6	2.4	7	13.5	
2-JMS104.16	3/19/2007	S	1	8.6	7.2	11.7	
2-JMS104.16	3/19/2007	M	3	8.5	7	11.6	
2-JMS104.16	3/19/2007	M	5	8.5	7	11.6	
2-JMS104.16	3/19/2007	M	7	8.5	7	11.6	
2-JMS104.16	3/19/2007	B	9	8.5	6.9	11.7	
2-JMS104.16	4/30/2007	S	1	19.8	7.6	8.6	
2-JMS104.16	4/30/2007	M	3	19	7.6	8.8	
2-JMS104.16	4/30/2007	M	5	19	7.5	8.8	
2-JMS104.16	4/30/2007	M	7	18.8	7.5	8.8	
2-JMS104.16	4/30/2007	B	8	18.8	7.5	8.8	
2-JMS104.16	5/30/2007	S	1	28.6	8.4	7.1	
2-JMS104.16	5/30/2007	M	2	28	8.2	6.8	
2-JMS104.16	5/30/2007	M	3	27.8	8.1	6.9	
2-JMS104.16	5/30/2007	M	4	27.7	8	6.9	
2-JMS104.16	5/30/2007	M	5	27.4	7.9	7	
2-JMS104.16	5/30/2007	M	6	27.1	7.8	6.9	
2-JMS104.16	5/30/2007	M	7	27	7.7	6.9	
2-JMS104.16	5/30/2007	B	8	27	7.7	6.9	
2-JMS104.16	6/18/2007	S	1	26.7	8.3	7.5	
2-JMS104.16	6/18/2007	M	2	26.4	8.2	7.6	
2-JMS104.16	6/18/2007	M	3	26.3	8.1	7.7	
2-JMS104.16	6/18/2007	M	4	26.1	8	7.6	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	6/18/2007	M	5	26	7.9	7.9	
2-JMS104.16	6/18/2007	M	6	25.9	7.8	7.5	
2-JMS104.16	6/18/2007	B	7	25.2	7.4	7.4	
2-JMS104.16	7/23/2007	S	1	28.2	8.1	7.5	
2-JMS104.16	7/23/2007	M	2	27.8	8	7.4	
2-JMS104.16	7/23/2007	M	3	27.4	7.9	7.4	
2-JMS104.16	7/23/2007	M	4	27.3	7.9	7.3	
2-JMS104.16	7/23/2007	M	5	27	7.8	7.3	
2-JMS104.16	7/23/2007	B	6	26.9	7.7	7.2	
2-JMS104.16	8/20/2007	S	1	27.8	7.4	5.8	
2-JMS104.16	8/20/2007	M	2	27.8	7.4	5.8	
2-JMS104.16	8/20/2007	M	3	27.7	7.4	5.8	
2-JMS104.16	8/20/2007	M	4	27.7	7.4	5.7	
2-JMS104.16	8/20/2007	M	5	27.6	7.4	5.7	
2-JMS104.16	8/20/2007	M	6	27.6	7.4	5.7	
2-JMS104.16	8/20/2007	B	7	27.6	7.4	5.7	
2-JMS104.16	9/24/2007	S	1	24.1	7.9	7.5	
2-JMS104.16	9/24/2007	M	2	24.3	7.9	7.6	
2-JMS104.16	9/24/2007	M	3	24.1	7.9	7.5	
2-JMS104.16	9/24/2007	M	4	24	7.9	7.5	
2-JMS104.16	9/24/2007	M	5	24	7.8	7.4	
2-JMS104.16	9/24/2007	M	6	24	7.8	7.4	
2-JMS104.16	9/24/2007	M	7	23.8	7.8	7.2	
2-JMS104.16	9/24/2007	B	8	23.7	7.7	7.2	
2-JMS104.16	10/22/2007	S	1	22.8	8.1	8.9	
2-JMS104.16	10/22/2007	M	2	22	7.8	7.7	
2-JMS104.16	10/22/2007	M	3	21.9	7.7	7.6	
2-JMS104.16	10/22/2007	M	4	21.8	7.7	7.6	
2-JMS104.16	10/22/2007	M	5	21.8	7.8	7.7	
2-JMS104.16	10/22/2007	M	6	21.8	7.8	7.7	
2-JMS104.16	10/22/2007	M	7	21.7	7.8	7.9	
2-JMS104.16	10/22/2007	B	8	21.7	7.8	7.9	
2-JMS104.16	11/13/2007	S	1	10.8	7.8	10.7	
2-JMS104.16	11/13/2007	M	2	10.6	7.8	10.6	
2-JMS104.16	11/13/2007	M	3	10.6	7.8	10.6	
2-JMS104.16	11/13/2007	M	4	10.5	7.8	10.7	
2-JMS104.16	11/13/2007	M	5	10.4	7.8	10.8	
2-JMS104.16	11/13/2007	M	6	10.4	7.8	10.8	
2-JMS104.16	11/13/2007	B	7	10.4	7.8	10.8	
2-JMS104.16	12/10/2007	S	1	6.5	7.6	12.2	
2-JMS104.16	12/10/2007	M	2	6.5	7.5	12.1	
2-JMS104.16	12/10/2007	M	3	6.5	7.5	12	
2-JMS104.16	12/10/2007	M	4	6.4	7.5	11.9	
2-JMS104.16	12/10/2007	M	5	6.3	7.5	11.9	
2-JMS104.16	12/10/2007	M	6	6.3	7.5	11.9	
2-JMS104.16	12/10/2007	M	7	6.4	7.5	12	
2-JMS104.16	12/10/2007	B	8	6.4	7.5	12.1	
2-JMS104.16	1/23/2008	S	1	3	7.3	13.5	
2-JMS104.16	1/23/2008	M	2	3	7.4	13.5	
2-JMS104.16	1/23/2008	M	3	3	7.3	13.6	
2-JMS104.16	1/23/2008	M	4	3	7.3	13.6	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	1/23/2008	M	5	3.1	7.3	13.7	
2-JMS104.16	1/23/2008	M	6	3.1	7.4	13.7	
2-JMS104.16	1/23/2008	B	7	3.1	7.4	13.7	
2-JMS104.16	2/14/2008	S	1	5.5	7	12.2	
2-JMS104.16	2/14/2008	M	2	5.4	7	12.3	
2-JMS104.16	2/14/2008	M	3	5.4	7	12.2	
2-JMS104.16	2/14/2008	M	4	5.4	7	12.2	
2-JMS104.16	2/14/2008	M	5	5.4	7	12.2	
2-JMS104.16	2/14/2008	M	6	5.4	7	12.2	
2-JMS104.16	2/14/2008	B	7	5.4	7	12.2	
2-JMS104.16	3/18/2008	S	1	12.8	7	10.3	
2-JMS104.16	3/18/2008	M	2	12.7	7	10.3	
2-JMS104.16	3/18/2008	M	3	12.6	7	10.3	
2-JMS104.16	3/18/2008	M	4	12.4	6.9	10.3	
2-JMS104.16	3/18/2008	M	5	12.1	6.9	10.3	
2-JMS104.16	3/18/2008	M	6	12.1	6.9	10.3	
2-JMS104.16	3/18/2008	M	7	12.1	6.9	10.3	
2-JMS104.16	3/18/2008	B	8	12.1	6.9	10.2	
2-JMS104.16	4/15/2008	S	1	16.2	6.9	9.1	
2-JMS104.16	4/15/2008	M	2	16	6.8	9.1	
2-JMS104.16	4/15/2008	M	3	16	6.8	9	
2-JMS104.16	4/15/2008	M	4	16	6.8	9	
2-JMS104.16	4/15/2008	M	5	16	6.8	9	
2-JMS104.16	4/15/2008	M	6	15.9	6.8	9	
2-JMS104.16	4/15/2008	M	7	15.9	6.8	9	
2-JMS104.16	4/15/2008	B	8	15.9	6.8	9	
2-JMS104.16	5/22/2008	S	1	19.1	7.6	8.7	
2-JMS104.16	5/22/2008	M	2	19	7.6	8.8	
2-JMS104.16	5/22/2008	M	3	18.9	7.6	8.8	
2-JMS104.16	5/22/2008	M	4	18.9	7.6	8.8	
2-JMS104.16	5/22/2008	M	5	18.9	7.6	8.9	
2-JMS104.16	5/22/2008	B	6	18.9	7.6	8.8	
2-JMS104.16	6/17/2008	S	1	29.7	7.6	6	
2-JMS104.16	6/17/2008	M	2	29.5	7.6	5.7	
2-JMS104.16	6/17/2008	M	3	29.4	7.6	5.7	
2-JMS104.16	6/17/2008	M	4	29.4	7.6	5.6	
2-JMS104.16	6/17/2008	M	5	29.4	7.5	5.7	
2-JMS104.16	6/17/2008	B	6	29.4	7.5	5.8	
2-JMS104.16	7/15/2008	S	1	29.3	8.1	6.5	
2-JMS104.16	7/15/2008	M	2	29	8	6.5	
2-JMS104.16	7/15/2008	M	3	28.7	8	6.5	
2-JMS104.16	7/15/2008	M	4	28.6	7.9	6.4	
2-JMS104.16	7/15/2008	M	5	28.5	7.9	6.2	
2-JMS104.16	7/15/2008	M	6	28.5	7.9	6.3	
2-JMS104.16	7/15/2008	M	7	28.5	7.9	6.3	
2-JMS104.16	7/15/2008	B	8	28.5	7.9	6.3	
2-JMS104.16	9/16/2008	S	1	26.4	7.4	6	
2-JMS104.16	9/16/2008	M	2	26.4	7.4	6	
2-JMS104.16	9/16/2008	M	3	26.4	7.4	6	
2-JMS104.16	9/16/2008	M	4	26.4	7.4	6	
2-JMS104.16	9/16/2008	M	5	26.4	7.3	6	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	9/16/2008	M	6	26.4	7.3	6	
2-JMS104.16	9/16/2008	M	7	26.4	7.3	6	
2-JMS104.16	9/16/2008	M	8	26.4	7.3	6	
2-JMS104.16	9/16/2008	B	9	26.4	7.3	6	
2-JMS104.16	10/21/2008	S	1	18.2	7.7	8	
2-JMS104.16	10/21/2008	M	2	18.1	7.7	7.9	
2-JMS104.16	10/21/2008	M	3	18	7.7	7.9	
2-JMS104.16	10/21/2008	M	4	17.4	7.7	8.3	
2-JMS104.16	10/21/2008	M	5	17.3	7.7	8.5	
2-JMS104.16	10/21/2008	M	6	17.3	7.7	8.7	
2-JMS104.16	10/21/2008	B	7	17.3	7.7	9	
2-JMS104.16	11/24/2008	S	1	5.9	7.8	13.3	
2-JMS104.16	11/24/2008	M	2	5.9	7.8	13.2	
2-JMS104.16	11/24/2008	M	3	5.9	7.8	13.3	
2-JMS104.16	11/24/2008	M	4	5.9	7.8	13.2	
2-JMS104.16	11/24/2008	M	5	5.9	7.8	13.2	
2-JMS104.16	11/24/2008	M	6	5.9	7.8	13.3	
2-JMS104.16	11/24/2008	M	7	5.8	7.8	13.3	
2-JMS104.16	11/24/2008	B	8	5.9	7.9	13.4	
2-JMS104.16	12/9/2008	S	1	4.2	7.9	13.9	
2-JMS104.16	12/9/2008	M	2	4.2	8	13.9	
2-JMS104.16	12/9/2008	M	3	4.2	8	13.9	
2-JMS104.16	12/9/2008	M	4	4.2	8	13.9	
2-JMS104.16	12/9/2008	M	5	4.2	8	13.9	
2-JMS104.16	12/9/2008	M	6	4.2	8.1	14	
2-JMS104.16	12/9/2008	B	7	4.2	8.1	13.9	
2-JMS104.16	1/21/2009	S	1	0.9	7.5	14	
2-JMS104.16	1/21/2009	M	2	0.9	7.5	14	
2-JMS104.16	1/21/2009	M	3	0.9	7.5	14	
2-JMS104.16	1/21/2009	M	4	0.9	7.5	14	
2-JMS104.16	1/21/2009	M	5	0.9	7.4	14.1	
2-JMS104.16	1/21/2009	M	6	0.9	7.4	14.2	
2-JMS104.16	1/21/2009	M	7	0.9	7.4	14.3	
2-JMS104.16	1/21/2009	M	8	0.9	7.4	14.4	
2-JMS104.16	1/21/2009	B	9	0.9	7.4	14.4	
2-JMS104.16	2/19/2009	S	1	7.3	6.9	11.5	
2-JMS104.16	2/19/2009	M	2	7.3	6.8	11.5	
2-JMS104.16	2/19/2009	M	3	7.3	6.8	11.6	
2-JMS104.16	2/19/2009	M	4	7.3	6.8	11.8	
2-JMS104.16	2/19/2009	M	5	7.6	6.5	11.8	
2-JMS104.16	2/19/2009	M	6	7.6	6.5	11.6	
2-JMS104.16	2/19/2009	M	7	7.6	6.5	11.7	
2-JMS104.16	2/19/2009	B	8	7.4	6.2	11.3	
2-JMS104.16	3/17/2009	S	1	9.3	7.5	10.7	
2-JMS104.16	3/17/2009	M	2	9.3	7.5	10.7	
2-JMS104.16	3/17/2009	M	3	9.3	7.5	10.8	
2-JMS104.16	3/17/2009	M	4	9.3	7.5	10.8	
2-JMS104.16	3/17/2009	M	5	9.3	7.5	10.7	
2-JMS104.16	3/17/2009	M	6	9.3	7.5	10.8	
2-JMS104.16	3/17/2009	M	7	9.3	7.5	10.7	
2-JMS104.16	3/17/2009	M	8	9.2	7.4	10.9	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	3/17/2009	B	9	9.2	7.5	11	
2-JMS104.16	4/30/2009	S	1	20.4	7.4	8.6	
2-JMS104.16	4/30/2009	M	2	20.4	7.4	8.6	
2-JMS104.16	4/30/2009	M	3	20.2	7.4	8.6	
2-JMS104.16	4/30/2009	M	4	20.2	7.4	8.6	
2-JMS104.16	4/30/2009	M	5	20.1	7.4	8.6	
2-JMS104.16	4/30/2009	M	6	20.1	7.4	8.6	
2-JMS104.16	4/30/2009	B	7	20.1	7.4	8.6	
2-JMS104.16	5/19/2009	S	1	18.8	7.6	9.4	
2-JMS104.16	5/19/2009	M	2	18.7	7.6	9.4	
2-JMS104.16	5/19/2009	M	3	18.7	7.7	9.5	
2-JMS104.16	5/19/2009	M	4	18.7	7.7	9.5	
2-JMS104.16	5/19/2009	M	5	18.7	7.7	9.5	
2-JMS104.16	5/19/2009	M	6	18.7	7.7	9.4	
2-JMS104.16	5/19/2009	M	7	18.7	7.7	9.4	
2-JMS104.16	5/19/2009	B	8	18.7	7.7	9.2	
2-JMS104.16	6/16/2009	S	1	25.2	7.4	7.7	
2-JMS104.16	6/16/2009	M	2	25	7.4	7.8	
2-JMS104.16	6/16/2009	M	3	25	7.4	7.8	
2-JMS104.16	6/16/2009	M	4	24.9	7.4	7.7	
2-JMS104.16	6/16/2009	M	5	25	7.4	7.5	
2-JMS104.16	6/16/2009	M	6	25	7.4	7.3	
2-JMS104.16	6/16/2009	B	7	25	7.4	7.3	
2-JMS104.16	7/21/2009	S	1	28.3	7.7	6.5	
2-JMS104.16	7/21/2009	M	2	28.1	7.7	6.5	
2-JMS104.16	7/21/2009	M	3	28.1	7.7	6.6	
2-JMS104.16	7/21/2009	M	4	28	7.7	6.6	
2-JMS104.16	7/21/2009	M	5	28	7.7	6.5	
2-JMS104.16	7/21/2009	M	6	28	7.7	6.4	
2-JMS104.16	7/21/2009	M	7	28	7.7	6.3	
2-JMS104.16	7/21/2009	B	8	28	7.7	6.4	
2-JMS104.16	8/18/2009	S	1	30.3	8.5	7.6	
2-JMS104.16	8/18/2009	M	2	29.4	8.1	6.6	
2-JMS104.16	8/18/2009	M	3	29.3	8	6.6	
2-JMS104.16	8/18/2009	M	4	29.3	7.9	6.4	
2-JMS104.16	8/18/2009	M	5	29.2	7.9	6.4	
2-JMS104.16	8/18/2009	M	6	29.2	7.9	6.3	
2-JMS104.16	8/18/2009	M	7	29.2	8	6.3	
2-JMS104.16	8/18/2009	B	8	29.2	8	6.3	
2-JMS104.16	9/15/2009	S	1	24.5	7.9		
2-JMS104.16	9/15/2009	M	2	23.8	7.8		
2-JMS104.16	9/15/2009	M	3	23.8	7.7		
2-JMS104.16	9/15/2009	M	4	23.7	7.8		
2-JMS104.16	9/15/2009	M	5	23.7	7.8		
2-JMS104.16	9/15/2009	M	6	23.7	7.8		
2-JMS104.16	9/15/2009	M	7	23.7	7.8		
2-JMS104.16	9/15/2009	M	8	23.7	7.8		
2-JMS104.16	9/15/2009	B	9	23.7	7.8		
2-JMS104.16	10/28/2009	S	1	16.6	7.6	8.1	
2-JMS104.16	10/28/2009	M	2	16.2	7.6	8	
2-JMS104.16	10/28/2009	M	3	16	7.6	7.9	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	10/28/2009	M	4	16	7.6	7.9	
2-JMS104.16	10/28/2009	M	5	16	7.6	7.9	
2-JMS104.16	10/28/2009	M	6	16	7.6	8	
2-JMS104.16	10/28/2009	B	7	16	7.6	8.2	
2-JMS104.16	11/9/2009	S	1	13.4	7.8		
2-JMS104.16	11/9/2009	M	2	13.2	7.8		
2-JMS104.16	11/9/2009	M	3	13	7.8		
2-JMS104.16	11/9/2009	M	4	13	7.8		
2-JMS104.16	11/9/2009	M	5	13	7.8		
2-JMS104.16	11/9/2009	M	6	12.9	7.8		
2-JMS104.16	11/9/2009	M	7	13	7.8		
2-JMS104.16	11/9/2009	B	8	12.9	7.8		
2-JMS104.16	12/8/2009	S	1	6.6	6.9	12.1	
2-JMS104.16	12/8/2009	M	2	6.6	6.9	12.1	
2-JMS104.16	12/8/2009	M	3	6.6	6.9	12.1	
2-JMS104.16	12/8/2009	M	4	6.6	6.8	12.2	
2-JMS104.16	12/8/2009	M	5	6.6	6.8	12.2	
2-JMS104.16	12/8/2009	M	6	6.6	6.8	12.2	
2-JMS104.16	12/8/2009	B	7	6.6	6.7	12.2	
2-JMS104.16	1/25/2010	S	1	7.5	7.5	11.1	
2-JMS104.16	1/25/2010	M	2	7.4	7.5	11	
2-JMS104.16	1/25/2010	M	3	7.4	7.5	10.9	
2-JMS104.16	1/25/2010	M	4	7.4	7.5	10.9	
2-JMS104.16	1/25/2010	M	5	7.4	7.5	10.8	
2-JMS104.16	1/25/2010	M	6	7.4	7.5	10.7	
2-JMS104.16	1/25/2010	M	7	7.4	7.4	10.6	
2-JMS104.16	1/25/2010	B	8	7.4	7.4	10.6	
2-JMS104.16	2/17/2010	S	1	2.8	7.6	12.8	
2-JMS104.16	2/17/2010	M	2	2.8	7.6	12.8	
2-JMS104.16	2/17/2010	M	3	2.7	7.6	12.8	
2-JMS104.16	2/17/2010	M	4	2.7	7.6	12.8	
2-JMS104.16	2/17/2010	M	5	2.7	7.6	12.8	
2-JMS104.16	2/17/2010	M	6	2.7	7.6	12.9	
2-JMS104.16	2/17/2010	B	7	2.7	7.5	12.9	
2-JMS104.16	3/4/2010	S	1	5.6	7.7	12.7	
2-JMS104.16	3/4/2010	M	2	5.7	7.6	12.7	
2-JMS104.16	3/4/2010	M	3	5.6	7.6	12.7	
2-JMS104.16	3/4/2010	M	4	5.6	7.6	12.7	
2-JMS104.16	3/4/2010	M	5	5.6	7.6	12.7	
2-JMS104.16	3/4/2010	M	6	5.6	7.6	12.7	
2-JMS104.16	3/4/2010	M	7	5.6	7.6	12.7	
2-JMS104.16	3/4/2010	B	8	5.6	7.6	12.7	
2-JMS104.16	4/6/2010	S	1	18.5	7.6	9.5	
2-JMS104.16	4/6/2010	M	2	18.4	7.6	9.5	
2-JMS104.16	4/6/2010	M	3	18.3	7.5	9.4	
2-JMS104.16	4/6/2010	M	4	18.3	7.5	9.4	
2-JMS104.16	4/6/2010	M	5	18.3	7.5	9.4	
2-JMS104.16	4/6/2010	M	6	18.3	7.5	9.4	
2-JMS104.16	4/6/2010	B	7	18.3	7.5	9.4	
2-JMS104.16	5/4/2010	S	1	23.7	8.4		
2-JMS104.16	5/4/2010	M	2	23.6	8.3		

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	5/4/2010	M	3	23.6	8.3		
2-JMS104.16	5/4/2010	M	4	23.5	8.2		
2-JMS104.16	5/4/2010	M	5	23.5	8.1		
2-JMS104.16	5/4/2010	M	6	23.5	8.1		
2-JMS104.16	5/4/2010	B	7	23.5	8.1		
2-JMS104.16	6/2/2010	S	1	26.5	7.5		
2-JMS104.16	6/2/2010	M	2	26.3	7.4		
2-JMS104.16	6/2/2010	M	3	26.2	7.4		
2-JMS104.16	6/2/2010	M	4	26.2	7.4		
2-JMS104.16	6/2/2010	M	5	26.2	7.4		
2-JMS104.16	6/2/2010	B	6	26.2	7.4		
2-JMS104.16	7/7/2010	S	1	30.8	8.6	9.8	
2-JMS104.16	7/7/2010	M	2	30.5	8.5	9.5	
2-JMS104.16	7/7/2010	M	3	30.2	8.4	9.1	
2-JMS104.16	7/7/2010	M	4	30.1	8.2	8.7	
2-JMS104.16	7/7/2010	M	5	29.4	7.8	7.7	
2-JMS104.16	7/7/2010	M	6	28.8	7.4	6	
2-JMS104.16	7/7/2010	M	7	28.7	7.3	5.7	
2-JMS104.16	7/7/2010	B	8	28.6	7.3	5.1	
2-JMS104.16	8/3/2010	S	1	29	8	8.2	
2-JMS104.16	8/3/2010	M	2	28.5	7.8	7.5	
2-JMS104.16	8/3/2010	M	3	28.2	7.7	7.2	
2-JMS104.16	8/3/2010	M	4	28.1	7.7	7	
2-JMS104.16	8/3/2010	M	5	28.1	7.7	7	
2-JMS104.16	8/3/2010	M	6	28.1	7.7	7	
2-JMS104.16	8/3/2010	B	7	28.1	7.7	6.9	
2-JMS104.16	9/8/2010	S	1	27.3	8.1	7.9	
2-JMS104.16	9/8/2010	M	2	27.3	8.1	7.8	
2-JMS104.16	9/8/2010	M	3	27.3	8	7.8	
2-JMS104.16	9/8/2010	M	4	27.2	8	7.4	
2-JMS104.16	9/8/2010	M	5	27.2	8	7.6	
2-JMS104.16	9/8/2010	M	6	27.1	7.9	7.4	
2-JMS104.16	9/8/2010	B	7	27.1	7.9	7.4	
2-JMS104.16	10/5/2010	S	1	18.6	7.7		
2-JMS104.16	10/5/2010	M	2	18.3	7.7		
2-JMS104.16	10/5/2010	M	3	18.4	7.7		
2-JMS104.16	10/5/2010	M	4	18.4	7.7		
2-JMS104.16	10/5/2010	M	5	18.2	7.7		
2-JMS104.16	10/5/2010	M	6	18.2	7.7		
2-JMS104.16	10/5/2010	M	7	18.2	7.7		
2-JMS104.16	10/5/2010	M	8	18.2	7.7		
2-JMS104.16	10/5/2010	B	9	18.2	7.7		
2-JMS104.16	11/2/2010	S	1	14.7	7.8	10.2	
2-JMS104.16	11/2/2010	M	2	14.7	7.8	10.2	
2-JMS104.16	11/2/2010	M	3	14.7	7.8	10.2	
2-JMS104.16	11/2/2010	M	4	14.6	7.8	10.2	
2-JMS104.16	11/2/2010	M	5	14.5	7.8	10.2	
2-JMS104.16	11/2/2010	M	6	14.4	7.8	10.3	
2-JMS104.16	11/2/2010	M	7	14.4	7.8	10.3	
2-JMS104.16	11/2/2010	M	8	14.4	7.8	10.3	
2-JMS104.16	11/2/2010	B	9	14.3	7.8	10.3	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	1/4/2011	S	1	3.3	7.8	13.7	
2-JMS104.16	1/4/2011	M	2	3.3	7.8	13.7	
2-JMS104.16	1/4/2011	M	3	3.3	7.8	13.7	
2-JMS104.16	1/4/2011	M	4	3.3	7.8	13.7	
2-JMS104.16	1/4/2011	M	5	3.3	7.8	13.7	
2-JMS104.16	1/4/2011	M	6	3.3	7.8	13.7	
2-JMS104.16	1/4/2011	B	7	3.3	7.8	13.7	
2-JMS104.16	2/1/2011	S	1	3.9	7.6	13.3	
2-JMS104.16	2/1/2011	M	2	3.9	7.6	13.3	
2-JMS104.16	2/1/2011	M	3	3.8	7.6	13.3	
2-JMS104.16	2/1/2011	M	4	3.8	7.6	13.3	
2-JMS104.16	2/1/2011	M	5	3.8	7.5	13.3	
2-JMS104.16	2/1/2011	M	6	3.8	7.5	13.3	
2-JMS104.16	2/1/2011	M	7	3.8	7.5	13.3	
2-JMS104.16	2/1/2011	M	8	3.8	7.5	13.3	
2-JMS104.16	2/1/2011	B	9	3.8	7.4	13.2	
2-JMS104.16	3/1/2011	S	1	12.2	7.5	10	
2-JMS104.16	3/1/2011	M	2	12.1	7.5	10	
2-JMS104.16	3/1/2011	M	3	12	7.5	10	
2-JMS104.16	3/1/2011	M	4	11.8	7.5	10	
2-JMS104.16	3/1/2011	M	5	11.8	7.5	9.9	
2-JMS104.16	3/1/2011	M	6	11.8	7.4	9.9	
2-JMS104.16	3/1/2011	M	7	11.8	7.4	9.9	
2-JMS104.16	3/1/2011	M	8	11.8	7.4	9.9	
2-JMS104.16	3/1/2011	B	9	11.7	7.4	9.9	
2-JMS104.16	4/14/2011	S	1	16.5	7.7	10	
2-JMS104.16	4/14/2011	M	2	16.5	7.7	10	
2-JMS104.16	4/14/2011	M	3	16.5	7.7	10	
2-JMS104.16	4/14/2011	M	4	16.4	7.7	10	
2-JMS104.16	4/14/2011	M	5	16.4	7.7	10	
2-JMS104.16	4/14/2011	M	6	16.4	7.7	10	
2-JMS104.16	4/14/2011	M	7	16.5	7.7	10	
2-JMS104.16	4/14/2011	M	8	16.4	7.7	9.9	
2-JMS104.16	4/14/2011	B	9	16.4	7.7	9.9	
2-JMS104.16	5/3/2011	S	1	19.2	7.4	9.6	
2-JMS104.16	5/3/2011	M	2	19.1	7.4	9.6	
2-JMS104.16	5/3/2011	M	3	19.1	7.4	9.6	
2-JMS104.16	5/3/2011	M	4	19.1	7.4	9.6	
2-JMS104.16	5/3/2011	M	5	19	7.4	9.6	
2-JMS104.16	5/3/2011	M	6	19	7.4	9.6	
2-JMS104.16	5/3/2011	M	7	18.8	7.4	9.6	
2-JMS104.16	5/3/2011	B	8	18.8	7.5	9.8	
2-JMS104.16	7/19/2011	S	1	29.6	7.8	6.4	
2-JMS104.16	7/19/2011	M	2	29.4	7.7	6.1	
2-JMS104.16	7/19/2011	M	3	29.4	7.6	6	
2-JMS104.16	7/19/2011	M	4	29.4	7.5	6	
2-JMS104.16	7/19/2011	M	5	29.4	7.5	6	
2-JMS104.16	7/19/2011	B	6	29.3	7.5	5.9	
2-JMS104.16	8/2/2011	S	1	32.1	7.7	5.9	
2-JMS104.16	8/2/2011	M	2	32	7.7	5.8	
2-JMS104.16	8/2/2011	M	3	31.8	7.6	5.5	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	8/2/2011	M	4	31.7	7.6	5.4	
2-JMS104.16	8/2/2011	M	5	31.7	7.6	5.3	
2-JMS104.16	8/2/2011	M	6	31.7	7.6	5.1	
2-JMS104.16	8/2/2011	B	7	31.7	7.5	5.1	
2-JMS104.16	9/22/2011	S	1	22.5	7.9	8.2	
2-JMS104.16	9/22/2011	M	2	22.3	7.9	8.1	
2-JMS104.16	9/22/2011	M	3	22.3	7.9	8	
2-JMS104.16	9/22/2011	M	4	22.2	7.9	8	
2-JMS104.16	9/22/2011	M	5	22.2	7.9	7.9	
2-JMS104.16	9/22/2011	M	6	22.2	7.8	7.8	
2-JMS104.16	9/22/2011	B	7	22.2	7.8	7.8	
2-JMS104.16	10/4/2011	S	1	18.8	7.7	8.6	
2-JMS104.16	10/4/2011	M	2	18.7	7.8	8.7	
2-JMS104.16	10/4/2011	M	3	18.7	7.8	8.6	
2-JMS104.16	10/4/2011	M	4	18.7	7.8	8.7	
2-JMS104.16	10/4/2011	M	5	18.6	7.8	8.7	
2-JMS104.16	10/4/2011	M	6	18.6	7.7	8.6	
2-JMS104.16	10/4/2011	M	7	18.6	7.7	8.5	
2-JMS104.16	10/4/2011	B	8	18.5	7.7	8.5	
2-JMS104.16	11/1/2011	S	1	12.7	7.7	10.9	
2-JMS104.16	11/1/2011	M	2	12.7	7.7	10.8	
2-JMS104.16	11/1/2011	M	3	12.7	7.7	10.9	
2-JMS104.16	11/1/2011	M	4	12.7	7.7	10.9	
2-JMS104.16	11/1/2011	M	5	12.6	7.6	10.9	
2-JMS104.16	11/1/2011	M	6	12.6	7.6	10.9	
2-JMS104.16	11/1/2011	B	7	12.6	7.6	11	
2-JMS104.16	12/6/2011	S	1	9.16	7.54	11.25	
2-JMS104.16	12/6/2011	M	2	9.12	7.54	11.27	
2-JMS104.16	12/6/2011	M	3	9.11	7.54	11.31	
2-JMS104.16	12/6/2011	M	4	9.07	7.54	11.28	
2-JMS104.16	12/6/2011	M	5	9.07	7.54	11.31	
2-JMS104.16	12/6/2011	M	6	9.07	7.55	11.22	
2-JMS104.16	12/6/2011	M	7	9.06	7.55	10.66	
2-JMS104.16	12/6/2011	B	8	9.07	7.6	10.04	
2-JMS104.16	1/5/2012	S	1	3.93	7.66	13.42	
2-JMS104.16	1/5/2012	M	2	3.9	7.66	13.48	
2-JMS104.16	1/5/2012	M	3	3.91	7.66	13.61	
2-JMS104.16	1/5/2012	M	4	3.95	7.66	13.61	
2-JMS104.16	1/5/2012	M	5	3.93	7.67	13.61	
2-JMS104.16	1/5/2012	M	6	3.95	7.67	13.63	
2-JMS104.16	1/5/2012	M	7	3.95	7.66	13.76	
2-JMS104.16	1/5/2012	B	8	3.94	7.64	13.81	
2-JMS104.16	2/7/2012	S	1	7.82	7.73	11.84	
2-JMS104.16	2/7/2012	M	2	7.39	7.72	11.92	
2-JMS104.16	2/7/2012	M	3	7.28	7.71	11.89	
2-JMS104.16	2/7/2012	M	4	7.26	7.7	11.87	
2-JMS104.16	2/7/2012	M	5	7.23	7.68	11.9	
2-JMS104.16	2/7/2012	M	6	7.14	7.66	11.94	
2-JMS104.16	2/7/2012	M	7	7.14	7.61	11.93	
2-JMS104.16	2/7/2012	B	8	7.12	7.55	11.87	
2-JMS104.16	3/6/2012	S	1	8.77	7.78	12.16	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	3/6/2012	M	2	8.73	7.78	12.21	
2-JMS104.16	3/6/2012	M	3	8.69	7.79	12.2	
2-JMS104.16	3/6/2012	M	4	8.68	7.78	12.18	
2-JMS104.16	3/6/2012	M	5	8.68	7.78	12.15	
2-JMS104.16	3/6/2012	M	6	8.69	7.77	12.19	
2-JMS104.16	3/6/2012	M	7	8.68	7.78	12.24	
2-JMS104.16	3/6/2012	B	8	8.67	7.75	12.25	
2-JMS104.16	4/12/2012	S	1	15.13	7.91	9.6	
2-JMS104.16	4/12/2012	M	2	14.89	7.9	9.6	
2-JMS104.16	4/12/2012	M	3	14.83	7.89	9.54	
2-JMS104.16	4/12/2012	M	4	14.81	7.87	9.67	
2-JMS104.16	4/12/2012	B	5	14.81	7.85	9.64	
2-JMS104.16	5/3/2012	S	1	19.8	7.64	8.22	
2-JMS104.16	5/3/2012	M	2	19.57	7.64	8.28	
2-JMS104.16	5/3/2012	M	3	19.42	7.64	8.39	
2-JMS104.16	5/3/2012	M	4	19.32	7.65	8.4	
2-JMS104.16	5/3/2012	M	5	19.34	7.64	8.4	
2-JMS104.16	5/3/2012	B	6	19.33	7.64	8.42	
2-JMS104.16	6/14/2012	S	1	26.42	8.52	7.99	
2-JMS104.16	6/14/2012	M	2	26.41	8.51	7.96	
2-JMS104.16	6/14/2012	M	3	26.31	8.46	7.98	
2-JMS104.16	6/14/2012	M	4	26.15	8.33	7.91	
2-JMS104.16	6/14/2012	M	5	26.1	8.25	7.77	
2-JMS104.16	6/14/2012	M	6	25.95	8.12	7.7	
2-JMS104.16	6/14/2012	M	7	25.87	8.05	7.65	
2-JMS104.16	6/14/2012	B	8	25.82	7.82	7.05	
2-JMS104.16	7/19/2012	S	1	32.56	8.01	6.63	
2-JMS104.16	7/19/2012	M	2	31.73	7.82	6.02	
2-JMS104.16	7/19/2012	M	3	31.64	7.79	5.83	
2-JMS104.16	7/19/2012	M	4	31.42	7.66	5.34	
2-JMS104.16	7/19/2012	M	5	31.34	7.61	5.08	
2-JMS104.16	7/19/2012	M	6	31.24	7.56	4.9	
2-JMS104.16	7/19/2012	B	7	31.22	7.55	4.83	
2-JMS104.16	8/7/2012	S	1	30.56	8.01	6.19	
2-JMS104.16	8/7/2012	M	2	30.46	7.99	6.17	
2-JMS104.16	8/7/2012	M	3	30.25	7.92	5.95	
2-JMS104.16	8/7/2012	M	4	30.08	7.87	5.92	
2-JMS104.16	8/7/2012	M	5	30.08	7.85	5.91	
2-JMS104.16	8/7/2012	B	6	30.08	7.79	5.84	
2-JMS104.16	9/20/2012	S	1	23.99	7.6	6.24	
2-JMS104.16	9/20/2012	M	2	23.06	7.58	6.13	
2-JMS104.16	9/20/2012	M	3	23.05	7.56	6.15	
2-JMS104.16	9/20/2012	M	4	23.05	7.56	6.17	
2-JMS104.16	9/20/2012	M	5	23	7.56	6.1	
2-JMS104.16	9/20/2012	M	6	22.99	7.54	6.19	
2-JMS104.16	9/20/2012	B	7	23.01	7.4	4.52	
2-JMS104.16	10/23/2012	S	1	18.45	8.15	8.78	
2-JMS104.16	10/23/2012	M	2	17.65	8.23	8.78	
2-JMS104.16	10/23/2012	M	3	17.51	8.3	8.85	
2-JMS104.16	11/6/2012	S	1	11.42	8.11	10.38	
2-JMS104.16	11/6/2012	M	2	11.42	8.11	10.37	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
2-JMS104.16	11/6/2012	M	3	11.42	8.1	10.41	
2-JMS104.16	11/6/2012	M	4	11.41	8.09	10.42	
2-JMS104.16	11/6/2012	M	5	11.38	8.08	10.44	
2-JMS104.16	11/6/2012	M	6	11.39	8.07	10.49	
2-JMS104.16	11/6/2012	M	7	11.38	8.04	10.47	
2-JMS104.16	11/6/2012	B	8	11.35	8.02	8.64	
2-JMS104.16	12/4/2012	S	1	8.78	8.18	12.02	
2-JMS104.16	12/4/2012	M	2	8.68	8.19	12.07	
2-JMS104.16	12/4/2012	M	3	8.34	8.16	12.07	
2-JMS104.16	12/4/2012	M	4	8.33	8.15	12.05	
2-JMS104.16	12/4/2012	M	5	8.3	8.12	11.94	
2-JMS104.16	12/4/2012	B	6	8.26	7.43	8.85	
90th Percentile				**28.8**	**8.0**		
10th Percentile				**5.5**	**7.2**		

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
2-JMS104.16	02/17/1994 16:05	S	1	R	42	
	03/21/1994 15:20	S	1	R	55	
	04/14/1994 15:50	S	1	R	50	
	05/23/1994 16:35	S	1	R	50	
	06/09/1994 15:55	S	1	R	66	
	09/08/1994 15:20	S	1	R	96	
	10/17/1994 16:10	S	1	R	83	
	11/30/1994 15:35	S	1	R	69	
	12/06/1994 16:25	S	1	R	75	
	01/25/1995 15:30	S	1	R	53	
	02/27/1995 15:30	S	1	R	54	
	03/23/1995 16:20	S	1	R	56	
	04/18/1995 16:15	S	1	R	65	
	05/23/1995 15:35	S	1	R	40	
	06/20/1995 16:00	S	1	R	57	
	07/18/1995 15:50	S	1	R	66	
	08/23/1995 16:20	S	1	R	90	
	09/21/1995 15:10	S	1	R	110	
	10/19/1995 15:55	S	1	R	59	
	11/20/1995 16:10	S	1	R	65	
	12/14/1995 15:30	S	1	R	47	
	01/29/1996 16:00	S	1	R	26	
	02/20/1996 15:30	S	1	R	86	
	03/25/1996 15:30	S	1	R	56	
	04/29/1996 11:00	S	1	R	59	
	05/15/1996 15:05	S	1	R	50	
	06/18/1996 15:20	S	1	R	50	
	07/23/1996 16:00	S	1	R	59	
	08/20/1996 15:15	S	1	R	85	
	09/24/1996 15:20	S	1	R	56	
	10/22/1996 15:00	S	1	R	49	
	11/19/1996 15:40	S	1	R	58	
	12/10/1996 15:50	S	1	R	41	
	02/18/1997 16:25	S	1	R	38.2	
	03/18/1997 15:55	S	1	R	61.5	
	04/22/1997 16:00	S	1	R	64.9	
	05/28/1997 16:30	S	1	R	56	
	06/24/1997 16:05	S	1	R	60.1	
	07/15/1997 16:00	S	1	R	76.2	
	08/19/1997 15:45	S	1	R	67.7	
	09/23/1997 15:35	S	1	R	60.7	
	10/21/1997 15:30	S	1	R	70.2	
	11/18/1997 15:45	S	1	R	57.9	
	12/10/1997 16:00	S	1	R	70.8	
	01/21/1998 16:15	S	1	R	44.3	
	03/17/1998 15:55	S	1	R	42.3	
	04/21/1998 15:45	S	1	R	33.9	
	05/19/1998 15:45	S	1	R	46.3	
	06/23/1998 16:15	S	1	R	62.5	
	07/21/1998 16:00	S	1	R	81.4	

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
	08/18/1998 15:55	S	1	R	71	
	09/22/1998 18:00	S	1	R	87.8	
	10/20/1998 16:50	S	1	R	134	
	11/18/1998 15:45	S	1	R	83	
	12/15/1998 16:00	S	1	R	76	
	01/19/1999 15:45	S	1	R	78	
	02/23/1999 15:30	S	1	R	60	
	03/23/1999 16:00	S	1	R	48	
	04/20/1999 17:00	S	1	R	68	
	05/20/1999 15:45	S	1	R	62	
	06/22/1999 15:40	S	1	R	62.7	
	07/20/1999 16:45	S	1	R	85.8	
	08/17/1999 16:35	S	1	R	96.5	
	09/21/1999 16:45	S	1	R	36.5	
	10/28/1999 15:35	S	1	R	70.6	
	11/18/1999 16:00	S	1	S1	119.3	
	12/21/1999 15:40	S	1	R	51.6	
	01/18/2000 16:35	S	1	R	63.9	
	02/23/2000 14:35	S	1	R	51	
	03/28/2000 15:45	S	1	S1	84	
	04/24/2000 16:15	S	1	R	39	
	05/23/2000 17:55	S	1	R	54	
	06/20/2000 16:55	S	1	R	60.1	
	07/18/2000 17:05	S	1	R	78	
	08/22/2000 15:50	S	1	R	65.2	
	09/26/2000 17:05	S	1	S1	139.7	
	10/24/2000 15:50	S	1	R	81.5	
	11/28/2000 17:00	S	1	R	104	
	01/23/2001 14:30	S	1	R	53.4	
	02/20/2001 13:50	S	1	R	54	
	03/27/2001 15:15	S	1	R	30.3	
	04/24/2001 14:10	S	1	R	48	
	06/19/2001 15:00	S	1	R	52.8	
	07/24/2001 15:00	S	1	R	44.9	
	08/21/2001 16:00	S	1	R	59.5	
	09/18/2001 16:45	S	1	R	55.7	
	10/16/2001 15:35	S	1	R	120	
	11/27/2001 16:00	S	1	R	52.7	
	12/12/2001 15:15	S	1	R	109	
	01/22/2002 16:00	S	1	R	85	
	02/19/2002 15:35	S	1	R	44.1	
	03/19/2002 16:00	S	1	R	56.5	
	04/16/2002 16:10	S	1	S1	105.1	
	05/30/2002 17:10	S	1	R	66.4	
	06/25/2002 15:45	S	1	R	100	
	07/23/2002 15:25	S	1	R	114	
	08/13/2002 16:00	S	1	R	118	
	09/24/2002 16:10	S	1	R	107	
	10/22/2002 15:30	S	1	R	128	
	11/19/2002 15:40	S	1	R	32.3	

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
	12/10/2002 15:45	S	1	R	66.8	
	01/21/2003 16:00	S	1	R	56.3	
	02/25/2003 12:09	S	1	R	46.7	
	03/18/2003 16:10	S	1	R	54.3	
	05/27/2003 13:17	S	1	R	34.6	
	06/24/2003 15:30	S	1	R	49.2	
	07/15/2003 15:30	S	1	R	50	
	08/26/2003 16:30	S	1	R	56.2	
	09/24/2003 14:27	S	1	R	22.8	
	10/28/2003 16:00	S	1	R	70.4	
	11/18/2003 15:15	S	1	R	48	
	12/16/2003 15:30	S	1	R	40	
	02/25/2004 15:30	S	1	R	63.5	
	03/23/2004 15:00	S	1	R	53.4	
	04/20/2004 15:00	S	1	S1	98.9	
	05/18/2004 15:30	S	1	R	58	
	06/15/2004 15:30	S	1	R	48	
	07/20/2004 15:15	S	1	R	62.7	
	08/17/2004 15:30	S	1	R	58.6	
	09/21/2004 15:00	S	1	R	63.1	
	10/19/2004 15:00	S	1	R	34	
	11/16/2004 15:00	S	1	R	44	
	12/14/2004 15:45	S	1	R	50	
	01/26/2005 15:20	S	1	R	56	
	02/15/2005 15:15	S	1	R	70	
	03/22/2005 15:45	S	1	R	56	
	04/19/2005 16:15	S	1	R	58.2	
	05/24/2005 15:00	S	1	R	44	
	06/21/2005 15:20	S	1	R	80	
	07/19/2005 15:30	S	1	R	64	
	08/23/2005 16:00	S	1	R	68	
	09/20/2005 15:20	S	1	R	110	
	10/18/2005 16:00	S	1	R	56	
	11/15/2005 15:00	S	1	R	102	
	12/21/2005 15:40	S	1	R	52	
	01/17/2006 15:15	S	1	R	76	
	02/21/2006 15:30	S	1	R	55	
	03/20/2006 15:45	S	1	R	64	
	04/26/2006 15:30	S	1	R	51	
	05/15/2006 15:40	S	1	R	54	
	07/24/2006 15:00	S	1	R	90	
	08/22/2006 15:30	S	1	R	106	
	10/30/2006 15:30	S	1	R	52	
	11/15/2006 14:50	S	1	R	38	
	01/24/2007 15:15	S	1	R	56	
Average					**65**	

Attachment D

Inspection Report

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

October 22, 2012

Chesterfield County, Dept. of Utilities
Scott Smedley, Plant Manager
Falling Creek WWTP
P.O. Box 40
Chesterfield, VA 23832

RE: VPDES Permit No., VA0024996, Falling Creek WWTP Focused Inspection

Dear Mr. Smedley:

Enclosed is the report for the focused technical and laboratory inspection conducted on September 13, 2012 at the Falling Creek WWTP. There were no "Request for Action Items" noted in the focused tech/lab report, therefore a written response to the inspection report is not necessary at this time.

If you have any questions or comments regarding the inspections or if you have any further information to add to the official record, please feel free to contact me at Heather.Deihls@deq.virginia.gov or by phone at (804) 527-5064.

Sincerely,

Heather A. H. Deihls

Heather A. H. Deihls
Environmental Inspector

Enclosures

cc: File - ECM

Virginia Department of Environmental Quality

FOCUSED CEI TECH/LAB INSPECTION REPORT

FACILITY NAME: Chesterfield Co.- Falling Creek WWTP		**INSPECTION DATE:**	September 13, 2012
		INSPECTOR new 9/24/12	Heather A. H. Deihls and Meredith Williams — Heather 9.14.12
PERMIT No.: VA0024996		**REPORT DATE:**	September 14, 2012
TYPE OF FACILITY: ☑ Municipal ☑ Major; ☐ Industrial ☐ Minor; ☐ Federal ☐ Small Minor; ☐ HP ☐ LP		**TIME OF INSPECTION:**	0857 Arrival; 1120 Departure
		TOTAL TIME SPENT (including prep & travel)	14 hours
PHOTOGRAPHS: ☑ Yes ☐ No		**UNANNOUNCED INSPECTION?**	☐ Yes ☑ No
REVIEWED BY / Date: KW 9/25/12			
PRESENT DURING INSPECTION:	Shawn Weimer, DEQ; Scott Smedley, Plant Manager; Jim Brown, Chief Plant Operator; Erica Lowe, Assistant Chief Operator		

TECHNICAL INSPECTION

1. Has there been any new construction? • If so, were plans and specifications approved? Comments: CTO for nutrient removal approved 11/30/11.	☑ Yes ☐ No
2. Is the Operations and Maintenance Manual approved and up-to-date? Comments: Approved 6/1/12.	☑ Yes ☐ No
3. Are the Permit and/or Operation and Maintenance Manual specified licensed operator being met? Comments:	☑ Yes ☐ No
4. Are the Permit and/or Operation and Maintenance Manual specified operator staffing requirements being met? Comments:	☑ Yes ☐ No
5. Is there an established and adequate program for training personnel? Comments: DEQ, John Tyler training classes; Sacramento course	☑ Yes ☐ No
6. Are preventive maintenance task schedules being met? Comments:	☑ Yes ☐ No
7. Does the plant experience any organic or hydraulic overloading? Comments: The plant has occasional overflows from the stormwater diurnal basins, but reports none in the last year. The County attributes this to more aggressive I&I reduction; and the plant expansion has allowed the plant to better deal with large storm events. The last overflow was on 9/9/11. This is considered good progress.	☑ Yes ☐ No
8. Have there been any bypassing or overflows since the last inspection? Comments: See above.	☑ Yes ☐ No
9. Is the standby generator (including power transfer switch) operational and exercised regularly? Comments: Class I reliability met by 24 hour staffing and dual feed power from Dominion. Preventative maintenance on local switches every few years.	☐ Yes ☐ No
10. Is the plant alarm system operational and tested regularly? Comments: Alarms monitored by SCADA; not tested.	☑ Yes ☐ No

VA DEQ Focused CEI Tech/Lab Inspection Report

Permit #	VA0024996

TECHNICAL INSPECTION

11. Is sludge disposed of in accordance with the approved sludge management plan? Comments: Nutriblend takes Class A sludge.	☑ Yes ☐ No
12. Is septage received? • If so, is septage loading controlled, and are appropriate records maintained? Comments:	☐ Yes ☑ No
13. Are all plant records (operational logs, equipment maintenance, industrial waste contributors, sampling and testing) available for review and are records adequate? Comments: Records are maintained but were not reviewed during this focused inspection.	☑ Yes ☐ No

14. Which of the following records does the plant maintain?

☑ Operational logs ☑ Instrument maintenance & calibration

☑ Mechanical equipment maintenance ☑ Industrial Waste Contribution (Municipal facilities)

Comments:

15. What does the operational log contain?

☑ Visual observations ☑ Flow Measurement ☑ Laboratory results ☑ Process adjustments

☑ Control calculations ☐ Other (specify)

Comments:

16. What do the mechanical equipment records contain?

☑ As built plans and specs ☑ Manufacturers instructions ☑ Lubrication schedules

☑ Spare parts inventory ☑ Equipment/parts suppliers

☐ Other (specify)

Comments:

17. What do the industrial waste contribution records contain (Municipal only)?

☑ Waste characteristics ☑ Impact on plant ☑ Locations and discharge types

☐ Other (specify)

Comments:

18. Which of the following records are kept at the plant and available to personnel?

☑ Equipment maintenance records ☑ Operational log ☑ Industrial contributor records

☑ Instrumentation records ☑ Sampling and testing records

Comments:

19. List records not normally available to plant personnel and their location:

Comments: N/A

20. Are the records maintained for the required time period (three or five years)? Comments:	☑ Yes ☐ No

VA DEQ Focused CEI Tech/Lab Inspection Report

Permit #	VA0024996

UNIT PROCESS EVALUATION SUMMARY SHEET

UNIT PROCESS	APPLICABLE	PROBLEMS*	COMMENTS
Sewage Pumping			
Flow Measurement (Influent)			
Screening/Comminution			
Grit Removal			
Oil/Water Separator			
Flow Equalization			
Ponds/Lagoons			
Imhoff Tank			
Primary Sedimentation			
Trickling Filter			
Septic Tank and Sand Filter			
Rotating Biological Contactor			
Activated Sludge Aeration			
Biological Nutrient Removal	X		
Sequencing Batch Reactor			
Secondary Sedimentation			
Flocculation			
Tertiary Sedimentation			
Filtration			
Micro-Screening	X		
Activated Carbon Adsorption			
Chlorination			
Dechlorination			
Ozonation			
Ultraviolet Disinfection			
Post Aeration			
Flow Measurement (Effluent)	X		
Land Application (Effluent)			
Plant Outfall			
Sludge Pumping			
Flotation Thickening (DAF)			
Gravity Thickening			
Aerobic Digestion			
Anaerobic Digestion			
Lime Stabilization			
Centrifugation			
Sludge Press			
Vacuum Filtration			
Drying Beds			
Thermal Treatment			
Incineration			
Composting			
Land Application (Sludge)			

* Problem Codes

1. Unit Needs Attention
2. Abnormal Influent/Effluent
3. Evidence of Equipment Failure
4. Unapproved Modification or Temporary Repair
5. Evidence of Process Upset
6. Other (explain in comments)

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

This facility qualified for a focused inspection with the DEQ Risk Based Inspection Strategy (RBIS) this year due to a good compliance history. The focused inspection involved a review of the new fine screen system, Integrated Fixed Film Augmentation System (IFAS), methanol feed and storage, and the final effluent. The facility converted the 10.1 MGD existing activated sludge system to a four stage aerobic/anoxic system with Integrated Fixed Film (IFAS) augmentation. Components of the upgrade include: baffles installed in the aeration tanks to create four zones with IFAS media in the aeration zone.

Fine Screen System- See the checklist on page six. In order to prevent screen clogging in the IFAS system, fine material must be removed. The facility has installed two center flow band microscreens following coarse screening.

IFAS- The plant contains three tanks (with four zones each) for the IFAS. Each tank is sized differently and receives a proportional amount of flow based on manually set valves in a splitter box following primary clarification.

1st Zone: Pre-anoxic zone where denitrification occurs. RAS and primary influent enters the tanks. Each tank contains 2 mixers. Water was tan colored and appeared normal. Dissolved oxygen is measured continuously and was 0.0 mg/L at the time of inspection. The nitrate formed in the first aerobic zone is returned to this zone where the influent wastewater is used as the carbon source.

Tank 1: Some methanol is fed here to increase soluble BOD; wastewater was tan colored and well mixed

Tank 2: Some methanol is fed here to increase soluble BOD; wastewater was tan colored and well mixed

Tank 3: Wastewater was tan colored and well mixed. Due to a construction error, this zone connects to zone 2 via holes in the baffle wall. This allows media from zone 2 to go back and forth between zones. The facility reports that this has not affected treatment. Media was observed in this zone at the time of inspection.

2nd Zone: The first aerobic zone that contains growth media. Aeration is provided by new fine bubble diffusers. Four new blowers provide air to all three tanks; one or two blowers are used at a time. At the time of inspection, blowers one and three were being used. The facility is pleased with the performance of the new blowers. Target design dissolved oxygen is 4 mg/L. In order to keep media moving and discourage media rafting, dissolved oxygen is typically higher than the target at the end of the zone. The higher dissolved oxygen level requires more methanol usage. To further combat media rafting, a media mixing cycle is run for 10 minutes daily with an air flow of 2000 scfm. IMCR pumps recycle 200% of influent to the pre-anoxic zone. A cylindrical screen at the end of this zone keeps media in this chamber. Dissolved oxygen and temperature are continuously monitored. . Process control tests/calculations include sludge age, F:M ratio, pH, alkalinity, MLSS, 30 minute settleability, SVI, and SDI five days per week. (July process control data is attached to this report.) The facility reports that this test information is not as useful as when this plant was operating as a sludge activation system. This is because there is some treatment occurring on media surfaces which is not captured by traditional process control sludge tests. Some light foam was that quickly dissipated was observed. Sprayers were in use for foam control.

Tank 2&3: Some media rafting was noted at the time of inspection.

3rd Zone: The post-anoxic zone is used to remove any nitrates that may have passed through the first aerobic zone and relies upon methanol and endogenous respiration for the carbon source. Methanol is fed at the beginning of this zone. Methanol dosing is calculated by PLC based on flow, dissolved oxygen, and nitrate concentrations. Nitrate is continuously monitored at the beginning and end of this zone. At the time of inspection, the target nitrate was set to 5 mg/L. Average daily methanol usage for all three tanks is ~400 gallons. Total monthly usage for August 2012 was 11,096 gallons.

Tank 1: Nitrate was 5.2 mg/L at the end of this zone at the time of inspection. Contains one mixer. Methanol dose at inspection: 5.6 gal/hr.

Tank 2: Nitrate was 5.7 mg/L at the beginning of this zone at the time of inspection. Contains 2 mixers. Methanol dose at inspection: 2.0 gal/hr.

Tank 3: Contains one mixer. Some scum noted in one corner. Methanol dose at inspection: 3.6 gal/hr.

Permit #	VA0024996

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

IFAS continued-

4th Zone: The second aerobic zone (reaeration) is designed to release nitrogen gas, remove additional BOD, prevent denitrification from occurring in the secondary clarifier, and improve floc and turbidity. Air is provided by diffusers. The aeration pattern appeared good, some light foam was noted. Although ammonia probes are located in this zone the facility reports the data is not meaningful, so they are no longer used.

Methanol feed system: Four peristaltic pumps deliver methanol to the IFAS post anoxic tank. Each of the three tanks has a dedicated methanol pump with one backup pump present. Plant effluent (non-potable) water is used for dilution water. Potable water is also available if needed. Two- 8200 gallon methanol storage tanks are present. Tanks contain vapor recovery and are located in concrete walled secondary containment. Drains in secondary containment contain a sump pump that either sends stormwater to the head of the plant or if a methanol spill were to occur material would be pumped into a truck and sent offsite. As discussed previously, methanol rates are calculated by the PLC. The facility has added flow meters to the pump system because they discovered the manufacturer pump curves were not accurate enough to deliver the proper dosage to IFAS. A modernly equipped fire room is present to monitor the methanol system. The system is monitored 24 hours per day. Maintenance of the fire suppression system will be contracted.

VA DEQ Focused CEI Tech/Lab Inspection Report

Permit #	VA0024996

UNIT PROCESS: Microscreening (Center Flow Band Screens)

1.	Number of units:	2
	In operation:	1; rotated daily
2.	Proper flow distribution between units?	[ ] Yes [ ] No* [x] N/A
3.	All microscreen units operate properly?	[x] Yes [ ] No* [ ] N/A
a.	headloss through unit:	N/A gpm
b.	uniform rotation of drum?	[ ] Yes [ ] No* [x] N/A
c.	rotation speed:	N/A rpm
4.	Backwash system operate properly?	[x] Yes [ ] No* [ ] N/A
a.	all nozzles spray properly?	[ ] Yes [ ] No* [x] Not visible
b.	frequency of backwash:	Sprayers run when unit runs.
c.	backwash water delivery:	Sprayers
d.	backwash control:	[ ] Manual [x] Time Clock [x] Headloss [ ] Other:
5.	Evidence of following problems:	
a.	signs of wear on fabric mesh?	[ ] Yes* [x] No [ ] N/A
b.	tears in fabric mesh?	[ ] Yes* [x] No [ ] N/A
c.	accumulated slime or algae?	[ ] Yes* [x] No [ ] N/A
d.	grease or oil on fabric?	[ ] Yes* [x] No [ ] N/A
e.	fabric mesh clogged in spots?	[ ] Yes* [x] No [ ] N/A
6.	Backwash water flows freely to recycle point?	[x] Yes [ ] No* [ ] N/A
7.	General condition:	[ ] Good [x] Fair [ ] Poor*

Comments: #1- At the time of inspection, #1 was in use and #2 was in standby mode. #4: Sprayers run based on head differential between the screen influent and effluent. At the time of inspection, screens were set to run at a 7 inch differential. If differential reaches 9 inches, then the system will call for both screens to run. The standby unit runs on timer (every 120 minutes). #5- The screen units are not visible.
The backwash sprayers direct solids to a flume where solids are dewatered in a 'washpactor' similar to a screw press. Solids are then directed to a rolloff dumpster located inside the microscreen building. Screenings are hauled offsite weekly. Washpactor water is directed to the plant drain pump station at the head of the plant.
The microscreen building has automatically controlled ventilation and methane gas is continuously monitored for explosion hazard.

Permit #	VA0024996

LABORATORY INSPECTION

PRESENT DURING INSPECTION: James Barger

1.	Do lab records include sampling date/time, analysis date/time, sample location, test method, test results, analyst's initials, instrument calibration and maintenance, and Certificate of Analysis? ☑ Sampling Date/Time ☑ Analysis Date/Time ☑ Sample Location ☑ Test Method ☑ Test Results ☑ Analyst's Initials ☑ Instrument Calibration & Maintenance ☑ Chain of Custody ☑ Certificate of Analysis	
2.	Are Discharge Monitoring Reports complete and correct? Month(s) reviewed: July 2012 (VA0024996 & VAN040080)	☑ Yes ☐ No
3.	Are sample location(s) according to permit requirements (after all treatment unless otherwise specified)?	☑ Yes ☐ No
4.	Are sample collection, preservation, and holding times appropriate; and is sampling equipment adequate?	☑ Yes ☐ No
5.	Are grab and composite samples representative of the flow and the nature of the monitored activity?	☑ Yes ☐ No
6.	If analysis is performed at another location, are shipping procedures adequate? List parameters and name & address of contract lab(s): • Proctors Creek WWTP- TSS, ortho-P, TP, TKN, NO_2/NO_3, $cBOD_5$, Fecal JR Reed- Metals, toxicity, organics	☑ Yes ☐ No
7.	Is Laboratory equipment in proper operating range? Auto sampler: Effluent- 0°C; Influent-2°C; sample refrigerator: 3.5°C	☑ Yes ☐ No
8.	Are annual thermometer calibration(s) adequate? Auto samplers: 8/22/12; pH: 8/22/12; D.O.: 8/22/12; sample fridge: 8/22/12	☑ Yes ☐ No
9.	Is the laboratory grade watersupply adequate? N/A	☐ Yes ☐ No
10.	Are analytical balance(s) adequate? N/A	☐ Yes ☐ No
11.	Parameters evaluated during thisinspection (attach checklists) ☑ pH ☐ Temperature ☑ Total Residual Chlorine ☑ Dissolved Oxygen ☐ Biochemical Oxygen Demand ☐ Total Suspended Solids ☐ Other (specify) ☐ Other (specify) ☐ Other (specify)	

Comments:

VA DEQ Focused CEI Tech/Lab Inspection Report

Permit #	VA0024996

EFFLUENT FIELD DATA: Not ascertained.

Flow ____ MGD	**Dissolved Oxygen** ____ mg/L	**TRC (Contact Tank)** ____ mg/L
pH ____ S.U.	**Temperature** ____ °C	**TRC (Final Effluent)** ____ mg/L

Was a Sampling Inspection conducted? ☐ Yes (see Sampling Inspection Report) ☑ No

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS:

1. Type of outfall:
   ☑ Shore based ☐ Submerged
   Diffuser?
   ☐ Yes ☑ No

2. Are the outfall and supporting structures in good condition? **Not viewed during this focused inspection.**
   ☐ Yes ☐ No

3. Final Effluent (evidence of following problems): **None.**
   ☐ Sludge bar ☐ Grease ☐ Turbid effluent ☐ Visible foam ☐ Unusual color ☐ Oil sheen

4. Is there a visible effluent plume in the receiving stream? **Not viewed.**
   ☐ Yes ☐ No

5. Receiving stream: **Not viewed.**
   ☐ No observed problems ☐ Indication of problems (explain below)

   Comments: Effluent was viewed at the final sampling point, parshall flume. Final effluent was very clear and appeared to be of very good quality.

REQUEST for ACTION:

1. None.

NOTES and COMMENTS:

1. None.

ANALYST:	James Barger	VPDES NO.	VA0024996

Parameter: Dissolved Oxygen
Method: Luminescence-based Sensor Procedure
05/06

METHOD OF ANALYSIS:

X	ASTM D 888-09 (c) (HACH LDO must adhere to this method)

		Y	N
1)	If samples are collected, is collection carried out with a minimum of turbulence and air bubble formation? [ASTM 30.1]	In situ	
2)	If samples are collected, is the sample bottle allowed to overflow several times its volume? [Permit]	In situ	
3)	Is meter calibrated before use or at least daily? **NOTE:** Instrument must be in 'O_2 Calibration' mode and sensor cap must be above surface of liquid. [ASTM 29.1, 31.3 & 34.2.1; HACH 4.6.1]	X	
4)	Is calibration verification within 97% to 104% of the theoretical D.O.? [ASTM 31.3]	X	
5)	Does the lot code on the meter display match the lot code printed on the sensor cap? **NOTE:** Code begins with a number between '3' and '9'. [HACH 4.2.1.8]	X	
6)	Is sensor cap replaced after one year? **NOTE:** "Cap Expired icon" will display in results window and data exported will be flagged with an asterisk. [HACH 4.2.3.4] **-Replaced as needed (August 2012)**	X	
7)	Are air bubbles trapped on probe tip dislodged before taking a reading? [HACH 4.3]	X	
8)	Is black surface of the sensor cap clean and unscratched? [HACH 4.3]	X	
9)	When taking reading is probe deep enough in sample to cover the thermistor (metal button) on side of probe? **NOTE:** Care should be taken to not touch the thermistor because it will cause an incorrect temperature reading. [HACH 4.4.3]	X	
10)	Is sample stirred during analysis? [ASTM 31.2]	In situ	
11)	Is meter stabilized before reading D.O.? [HACH 4.4.5]	X	
12)	Is temperature recorded at time of analysis? [ASTM 32.1]	X	
13)	Is accuracy of thermistor checked annually? [Permit] **8/22/12**	X	
14)	Is 'Dry Storage' used for probes immersed less than 6 hrs. per day and 'Wet Storage' for tips immersed more than 6 hrs. per day? [HACH 2.1 & 2.2]	X	
15)	If using 'Dry Storage' is desiccant blue in Dry Storage Chamber? [HACH 4.3.1]	N/A	
16)	Has Initial Demonstration of Laboratory Capability been performed by each analyst? [ASTM 34.3]	X	
	a. Prepare Air-saturated Water by bubbling air for at least 30 min. through 1500mL water that is at room temperature (± 2°C).	---	
	b. Transfer aerated water to four clean BOD bottles until overflowing, then seal with a stopper.	---	
	c. Analyze samples.	---	
	d. Use a D.O. table to calculate theoretical D.O. based on sample temperature and barometric pressure. Results should be between 97-104% of calculated value.	---	

PROBLEMS: None.

COMMENTS: HACH HQ30d meter is used.

ANALYST:	**James Barger**	VPDES NO	**VA0024996**

Meter: **Thermo Orion 3 Star** Parameter: Hydrogen Ion (pH)
1/08

Method: Electrometric

METHOD OF ANALYSIS:

X	18th Edition of Standard Methods – 4500-H^+ B
	21st or Online Editions of Standard Methods – 4500-H^+ B (00)

	pH is a method-defined analyte so modifications are not allowed. [40 CFR Part 136.6]	Y	N
1)	Is a certificate of operator competence or initial demonstration of capability available for each analyst/operator performing this analysis? **NOTE**: Analyze 4 samples of known pH. May use external source of buffer (different lot/manufacturer than buffers used to calibrate meter). Recovery for each of the 4 samples must be +/- 0.1 SU of the known concentration of the sample. [SM 1020 B.1]	X	
2)	Is the electrode in good condition (no chloride precipitate, scratches, deterioration, etc.)? [2.b/c and 5.b]	X	
3)	Is electrode storage solution in accordance with manufacturer's instructions? [Mfr.]	X	
4)	Is meter calibrated on at least a daily basis using three buffers all of which are at the same temperature? [4.a] **NOTE**: Follow manufacturer's instructions.	X	
5)	After calibration, is a buffer analyzed as a check sample to verify that calibration is correct? Agreement should be within +/- 0.1 SU. [4.a]	X	
6)	Do the buffer solutions appear to be free of contamination or growths? [3.1]	X	
7)	Are buffer solutions within the listed shelf-life or have they been prepared within the last 4 weeks? [3.a]	X	
8)	Is the cap or sleeve covering the access hole on the reference electrode removed when measuring pH? [Mfr.]	X	
9)	For meters with ATC that also have temperature display, is the thermometer verified annually? [SM 2550 B.1] **8/22/12**	X	
10)	Is temperature of buffer solutions and samples recorded when determining pH? [4.a]	X	
11)	Is sample analyzed within 15 minutes of collections? [40 CFR Part 136]	X	
12)	Is the electrode rinsed and then blotted dry between reading solutions (Disregard if a portion of the next sample analyzed is used as the rinsing solution.)? [4.a]	X	
13)	Is the sample stirred gently at a constant speed during measurement? [4.b]	X	
14)	Does the meter hold a steady reading after reaching equilibrium? [4.b]	X	
15)	Is a duplicate sample analyzed after every 20 samples if citing 18th or 19th Edition or daily for 20th or 21st Edition? [Part 1020] **NOTE**: Not required for *in situ* samples.	N/A	
16)	Is the pH of duplicate samples within 0.1SU of the original sample? [Part 1020]	N/A	
17)	Is there a written procedure for which result will be reported on DMR (Sample or Duplicate) and is this procedure followed? [DEQ]	N/A	

PROBLEMS: None.

ANALYST:	**James Barger**	VPDES NO.	**VA0024996**

Instrument: **Pocket Colorimeter II** Parameter: Total Residual Chlorine (TRC)
Method: DPD Colorimetric (HACH Pocket Colorimeter)
1/08

METHOD OF ANALYSIS:

X	HACH Manufacturer's Instructions (Method 8167) plus an edition of *Standard Methods*
X	18th Edition of *Standard Methods* 4500-Cl G
	21st Edition of *Standard Methods* 4500-Cl G (00)

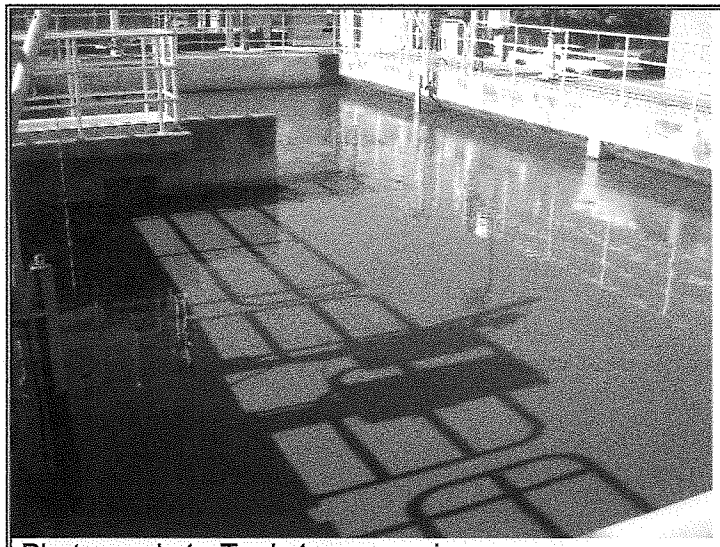
		Y	N
1)	Is a certificate of operator competence or initial demonstration of capability available for each analyst/operator performing this analysis? **NOTE:** Analyze 4 samples of known TRC. Must use a lot number or source that is different from that used to prepare calibration standards. May not use Spec√ ™. [SM 1020 B.1]	X	
2)	Are the DPD PermaChem™ Powder Pillows stored in a cool, dry place? [Mfr.]	X	
3)	Are the pillows within the manufacturer's expiration date? [Mfr.] **[Expire 11/2016]**	X	
4)	Has buffering capability of DPD pillows been checked annually? (Pillows should adjust sample pH to between 6 and 7) [Mfr.] **[performed 4/1/10]**	X	
5)	When pH adjustment is required, is H_2SO_4 or NaOH used? [Hach 11.3.1]	N/A	
6)	Are cells clean and in good condition? [Mfr]	X	
7)	Is the low range (0.01 mg/L resolution) used for samples containing residuals from 0.2.00 mg/L? [Mfr.]	X	
8)	Is calibration curve developed (may use manufacturer's calibration) with daily verification using a high and a low standard? **NOTE:** May use manufacturer's installed calibration and commercially available chlorine standards for daily calibration verifications. [18th ed 1020 B.5; 21st ed 4020 B.2.b]	X	
9)	Is the 10-mL cell (2.5-cm diameter) used for samples from 0-2.00 mg/L? [Mfr.]	X	
10)	Is meter zeroed correctly by using sample as blank for the cell used? [Mfr.]	X	
11)	Is the instrument cap placed correctly on the meter body when the meter is zeroed and when the sample is analyzed? [Mfr.]	X	
12)	Is the DPD Total Chlorine PermaChem™ Powder Pillow mixed into the sample? [Hach 11.1]	X	
13)	Is the analysis made at least three minutes but not more than six minutes after PermaChem™ Powder Pillow addition? [Hach 11.2]	X	
14)	If read-out is flashing [2.20], is sample diluted correctly, and then reanalyzed? [Hach 1.2 & 2.0]	X	
15)	Are samples analyzed within 15 minutes of collection? [40 CFR Part 136]	X	
16)	Is a duplicate sample analyzed after every 20 samples if citing 18th Edition [SM 1020 B.6] or daily for 21st Edition [SM 4020 B.3.c]?	N/A	
17)	If duplicate sample is analyzed, is the relative percent difference (RPD) ≤ 20? [18th ed. Table 1020 I; 21st ed. DEQ]	N/A	

PROBLEMS: **None.**

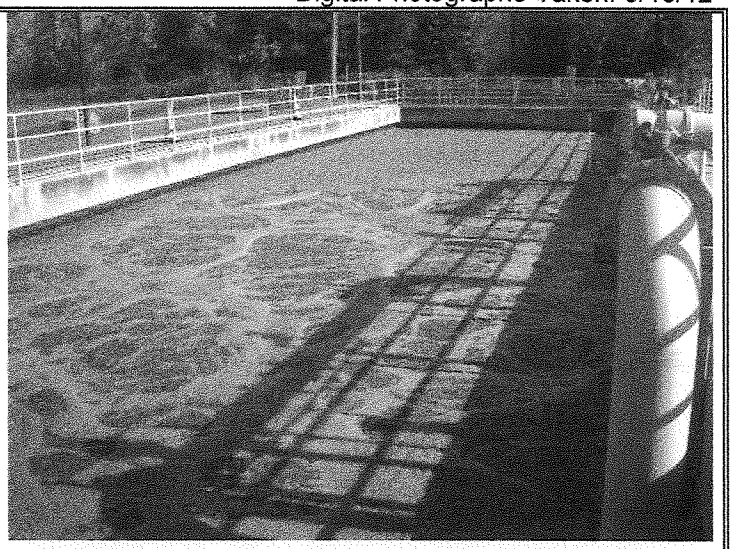
COMMENTS: **A LCS is performed quarterly (most recently 8/22/12). Spec-check standards expire 10/2013.**

Permit #	VA0024996

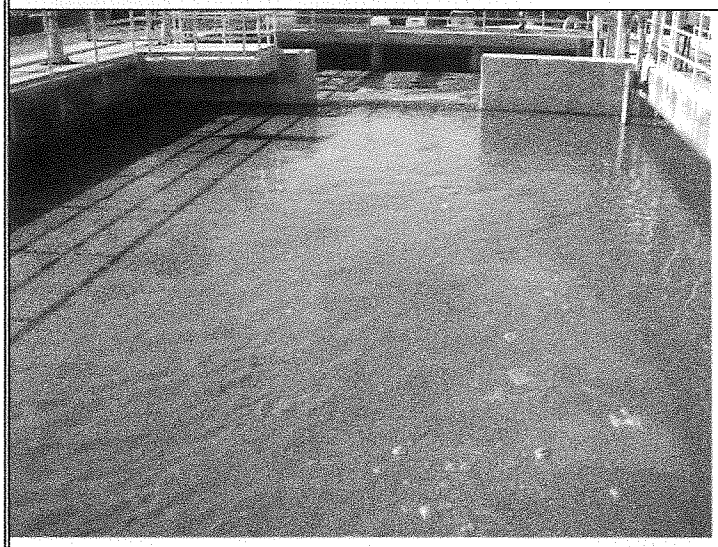
Digital Photographs Taken: 9/13/12



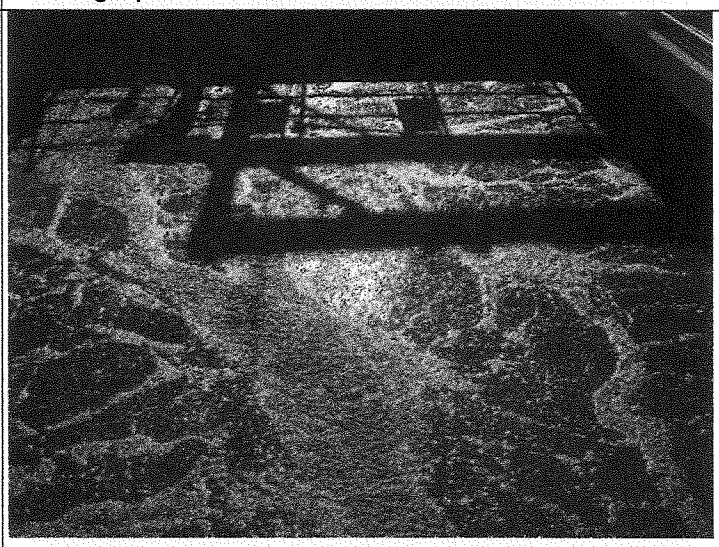
Photograph 1: Tank 1 pre-anoxic zone



Photograph 2: Tank 1 aeration zone



Photograph 3: Tank 1 post-anoxic zone



Photograph 4: Tank 1 re-aeration zone

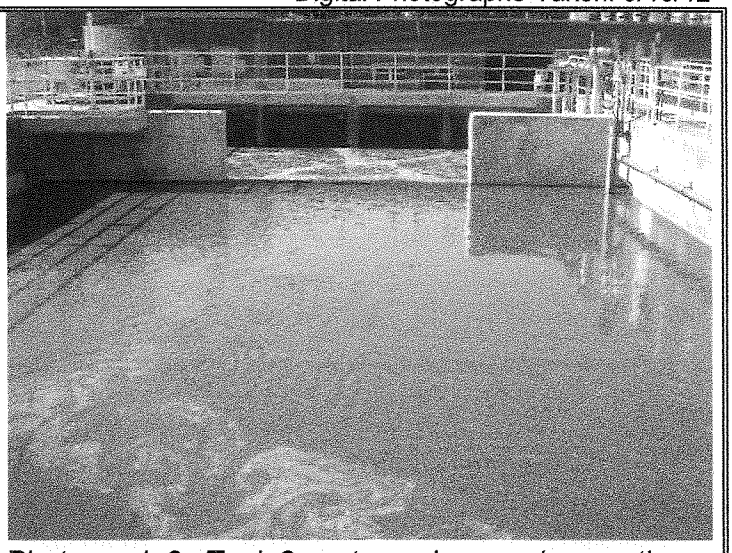
Photograph 5: Tank 2 pre-anoxic zone

Photograph 6: Tank 2 aeration zone (note: rafting media)

Permit #	VA0024996

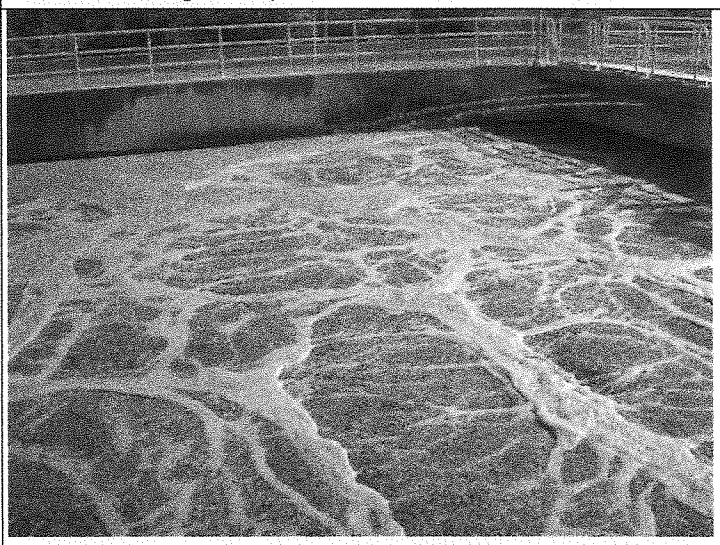
Digital Photographs Taken: 9/13/12

Photograph 7: Tank 2 methanol feed in post-anoxic zone

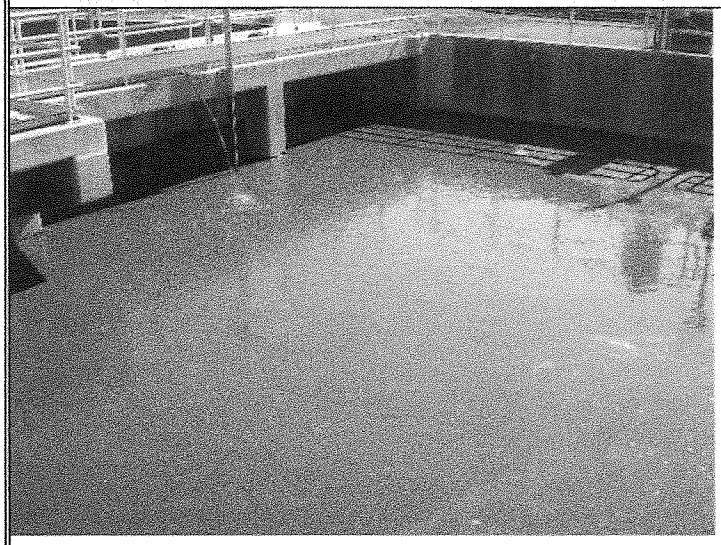


Photograph 8: Tank 2 post-anoxic zone (re-aeration zone in background)

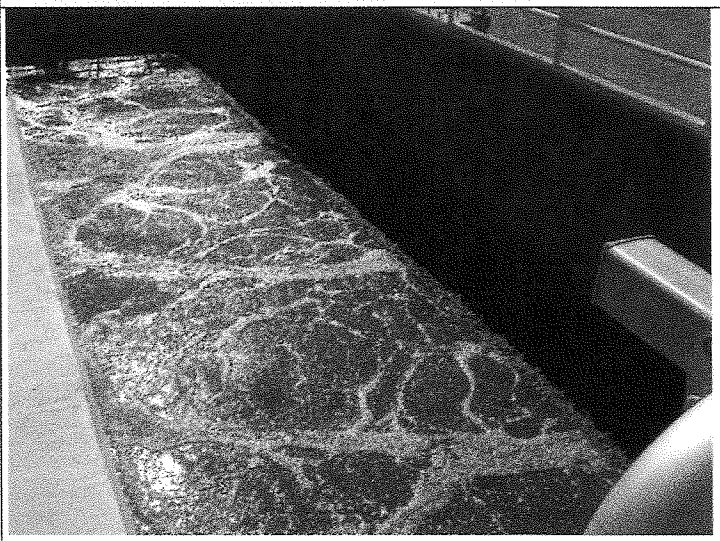
Photograph 9: Tank 3 pre-anoxic zone (note: media)



Photograph 10: Tank 3 aeration zone



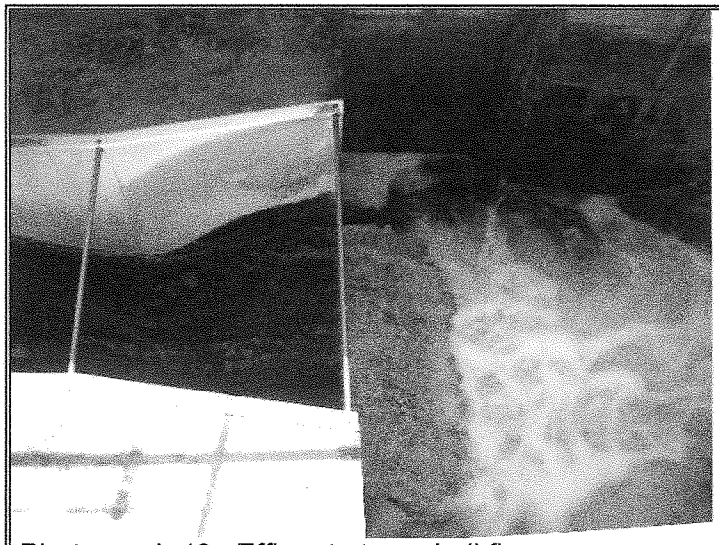
Photograph 11: Tank 3 post-anoxic zone



Photograph 12: Tank 3 post-aeration zone

Permit #	VA0024996

Digital Photographs Taken: 9/13/12



Photograph 13: Effluent at parshall flume

Falling Creek Chemical Usage

August 2012

Date	Hypochlorite Tank #1 Level ft	Hypochlorite Tank #2 Level ft	Total Hypochlorite used lbs	#1 Sodium Bisulfite Tank Level ft	#2 Sodium Bisulfite Tank Level ft	Eff Total Lbs Sodium Bisulfite Used Lbs	#1 Methanol Tank Level gal	#2 Methanol Tank Level gal	Total Methanol Used gal	Total Lime gal	Total Lime Used gal	#1 Alum Tank Level gal	#2 Alum Tank Level gal	Alum Added gal	Alum Usage	Available Alum
8/1/2012	3.5	13.8	552.61	0.1	4.6	132	2,138	7,004	410.5	4,000.0	500.0	6,517.8	794.9	0	0.30	7,312.7
8/2/2012	2.5	13.8	511.68	0.1	4.5	117	1,617	7,013	394.7	3,500.0	500.0	6,469.7	766.0	0	77.00	7,235.7
8/3/2012	1.3	13.8	598.67	0.1	4.4	176	1,123	7,005	391.7	3,000.0	500.0	6,464.9	768.0	0	2.80	7,232.9
8/4/2012	1.3	12.8	552.61	0.1	4.3	191			350.0	2,500.0	500.0	5,424.0	768.0	0	1,040.90	6,192.0
8/5/2012	1.3	12.0	383.76	0.1	4.2	117			350.0	7,500.0	500.0	4,600.0	768.0	0	824.00	5,368.0
8/6/2012	1.3	11.1	470.75	0.1	4.1	132	489	6,626	193.2	7,000.0	500.0	4,500.0	710.0	0	158.00	5,210.0
8/7/2012	1.3	10.1	511.68	0.1	4.0	117	483	6,307	341.7	6,000.0	1,000.0	4,420.0	786.0	0	4.00	5,206.0
8/8/2012	1.3	9.0	552.61	0.1	3.9	117	487	5,621	359.0	5,500.0	500.0	4,418.0	784.0	0	4.00	5,202.0
8/9/2012	1.3	8.0	511.68	0.1	3.8	132	483	5,059	354.9	4,000.0	1,500.0	4,365.0	771.0	0	66.00	5,136.0
8/10/2012	13.7	7.0	1,019.95	5.2	3.7	166	7,232	4,527	362.5	3,500.0	500.0	4,233.6	768.4	3,000	134.00	5,002.0
8/11/2012	13.7	5.9	552.61	5.2	3.6	117	7,221	4,039	360.6	3,000.0	500.0	7,013.5	786.8	0	201.70	7,800.3
8/12/2012	13.7	5.0	470.75	5.2	3.5	191			300.0	3,000.0	0.0	6,376.0	772.0	0	652.30	7,148.0
8/13/2012	13.7	3.9	552.61	5.2	3.4	117	7,215	3,429	222.7	2,500.0	500.0	6,376.0	772.0	0	0.00	7,148.0
8/14/2012	13.7	2.2	895.44	5.2	3.3	132	7,212	3,015	298.1	7,000.0	1,000.0	6,326.1	786.0		35.90	7,112.1
8/15/2012	13.7	1.8	220.02	5.2	3.3	117	7,208	2,612	318.1	6,000.0	1,000.0	6,387.0	725.0	0	0.10	7,112.0
8/16/2012	13.2	1.3	506.56	5.2	3.2	117	7,207	2,192	336.5	5,500.0	500.0	6,333.0	767.0	0	12.00	7,100.0
8/17/2012	12.2	1.3	511.68	5.2	3.0	191	7,203	1,685	357.8	5,000.0	500.0	6,349.0	779.0	0	-28.00	7,128.0
8/18/2012	11.3	1.3	470.75	5.2	3.0	132	7,222	1,141	375.6	5,000.0	0.0	787.9	5,482.6		857.50	6,270.5
8/19/2012	10.4	1.3	424.69	5.2	2.9	103	7,205	788	293.1	4,500.0	500.0	4,639.1	773.3	0	858.10	5,412.4
8/20/2012	9.5	1.3	470.75	5.2	2.8	132	7,123	483	318.6	4,000.0	500.0	3,949.0	779.2	0	684.20	4,728.2
8/21/2012	8.5	1.3	511.68	5.2	2.7	117	6,533	482	386.5	3,000.0	1,000.0	3,949.0	787.3	0	-8.10	4,736.3
8/22/2012	7.5	13.6	44.87	5.2	2.6	191	5,979	483	446.6	2,500.0	500.0	3,943.6	773.8	0	18.90	4,717.4
8/23/2012	6.7	13.6	429.81	5.2	2.5	117	5,464	485	394.8	2,500.0	0.0	3,988.4	797.0	0	-68.00	4,785.4
8/24/2012	5.7	13.6	506.56	5.2	2.4	117	4,970	7,048	426.5	6,500.0	0.0	3,888.0	801.0	4,267	96.40	4,689.0
8/25/2012	4.7	13.6	511.68	5.2	2.3	132	4,610	7,036	434.7	6,500.0	0.0	7,298.1	764.1		893.80	8,062.2
8/26/2012	3.5	13.6	598.67	5.2	2.2	176	4,027	7,016	359.0	5,500.0	1,000.0	6,368.8	763.5	0	929.90	7,132.3
8/27/2012	2.3	13.6	639.60	5.2	2.6	-542	3,577	7,026	382.3	5,000.0	500.0	5,697.5	795.3	0	639.50	6,492.8
8/28/2012	1.2	13.6	552.61	5.2	2.8	-249	3,087	7,046	421.5	4,500.0	500.0	5,730.0	782.0	0	-19.20	6,512.0
8/29/2012	1.2	12.6	511.68	5.2	2.6	249	2,558	7,062	436.7	3,500.0	1,000.0	5,770.0	780.0	0	-38.00	6,550.0
8/30/2012	1.2	11.8	424.69	5.2	2.3	366	2,108	7,062	380.4	3,000.0	500.0	5,739.1	788.9	4,600	22.00	6,528.0
8/31/2012	1.2	10.5	639.60	2.2	5.2	235	1,690	7,063	337.7	2,500.0	500.0	10,131.0	773.0	0	224.00	10,904.0
Minimum	1	1	44.87	0	2	-542	483	482	193.2	2,500.0	0.0	787.9	710.0	0	-68.00	4,689.0
Maximum	14	14	1,019.95	5	5	366	7,232	7,063	446.6	7,500.0	1,500.0	10,131.0	5,482.6	4,600	1,040.90	10,904.0
Total	197	268	16,113.32	111	104	3,655	123,471	126,355	11,096.0	37,000.0	17,000.0	168,453.1	28,713.1	11,867	8,276.00	197,166.2
Average	6	9	519.78	4	3	118	4,410	4,513	357.9	4,419.4	548.4	5,434.0	926.2	424	266.97	6,360.2

Daily avg. for August

Falling Creek Aeration Summary

July 2012

Date	AerTank1 MLSS mg/L	AerTank2 MLSS mg/L	AerTank3 MLSS mg/L	RAS Suspended Solids mg/L	AerTank1 30 Min Settleometer ml/L	AerTank2 30 Min Settleometer ml/L	AerTank3 30 Min Settleometer ml/L	AerTank 1 SVI mL/g	AerTank2 SVI mL/g	AerTank3 SVI mL/g	AerTank1 SDI	AerTank2 SDI	AerTank 3 SDI
7/1/2012													
7/2/2012	2,890	3,490	2,780	7,860	240	270	210	83	77	76	1.20	1.29	1.32
7/3/2012	3,640	3,780	2,970	8,500	310	330	290	85	87	98	1.17	1.15	1.02
7/4/2012													
7/5/2012	3,140	3,270	2,870	8,540	350	340	240	111	104	84	0.90	0.96	1.20
7/6/2012	3,680	3,420	2,810	4,360	280	320	230	76	94	82	1.31	1.07	1.22
7/7/2012													
7/8/2012													
7/9/2012	3,280	3,160	3,160	7,740	250	250	260	76	79	82	1.31	1.26	1.22
7/10/2012	2,980	3,350	2,400	7,370	230	260	180	77	78	75	1.30	1.29	1.33
7/11/2012	2,960	2,940	2,550	7,020	210	270	190	71	92	75	1.41	1.09	1.34
7/12/2012	3,010	3,300	2,370	7,380	250	280	190	83	85	80	1.20	1.18	1.25
7/13/2012	3,300	2,800	2,980	7,530	270	320	230	82	114	77	1.22	0.88	1.30
7/14/2012													
7/15/2012													
7/16/2012	3,120	3,050	2,350	7,560	270	270	200	87	89	85	1.16	1.13	1.18
7/17/2012	2,840	2,860	2,850	7,460	250	250	240	88	87	84	1.14	1.14	1.19
7/18/2012	2,990	3,200	2,450	7,760	290	270	220	97	84	90	1.03	1.19	1.11
7/19/2012	2,910	3,150	2,680	7,540	300	300	220	103	95	82	0.97	1.05	1.22
7/20/2012	3,090	3,090	3,010	7,520	280	260	210	91	84	70	1.10	1.19	1.43
7/21/2012													
7/22/2012													
7/23/2012	2,950	3,000	2,440	7,640	290	290	230	98	97	94	1.02	1.03	1.06
7/24/2012	3,020	3,130	2,390	7,780	300	300	290	99	96	121	1.01	1.04	0.82
7/25/2012	3,150	3,270	2,910	7,840	330	300	280	105	92	96	0.95	1.09	1.04
7/26/2012	3,160	3,050	2,520	7,740	300	310	250	95	102	99	1.05	0.98	1.01
7/27/2012	2,750	3,030	3,040	7,590	300	320	300	109	106	99	0.92	0.95	1.01
7/28/2012													
7/29/2012													
7/30/2012	3,140	3,490	3,040	7,490	300	310	280	96	89	92	1.05	1.13	1.09
7/31/2012	3,120	3,000	3,330	7,530	290	300	320	93	100	96	1.08	1.00	1.04
Minimum	2,750	2,800	2,350	4,360	210	250	180	71	77	70	0.90	0.88	0.82
Maximum	3,680	3,780	3,330	8,540	350	340	320	111	114	121	1.41	1.29	1.43
Average	3,101	3,182	2,757	7,512	280	291	241	91	92	87	1.12	1.10	1.16

Falling Creek Aeration Summary

July 2012

Date	AerTank1 Sludge Age	AerTank2 Sludge Age	AerTank3 Sludge Age	AerTank1 F/M Ratio	AerTank2 F/M Ratio	AerTank3 F/M Ratio	AerTank1 pH mg/L	AerTank 2 pH mg/L	AerTank3 pH mg/L	Aer Tank 1 Alk mg/l	Aer Tank 2 Alk mg/l	Aer Tank 3 Alk mg/l	FC AT1 tank flow	FC AT2 Tank Flow	FC AT3 Tank Flow
7/1/2012															
7/2/2012	8.04	9.69	7.71	0.17	0.14	0.17	6.7	6.7	6.7				3.58	5.10	2.65
7/3/2012	16.23	16.83	13.21	0.08	0.08	0.10	6.8	6.8	6.8				2.45	3.49	1.81
7/4/2012															
7/5/2012	18.54	19.28	16.90	0.07	0.07	0.08	6.8	6.8	6.8				2.12	3.02	1.57
7/6/2012	15.13	14.05	11.53	0.09	0.09	0.12	6.8	6.8	6.9				2.22	3.17	1.65
7/7/2012															
7/8/2012															
7/9/2012	17.64	16.97	16.95	0.08	0.08	0.08	6.8	6.8	6.8				2.17	3.09	1.61
7/10/2012	14.68	16.48	11.79	0.09	0.08	0.11	6.5	6.5	6.6				2.37	3.38	1.76
7/11/2012	11.27	11.18	9.69	0.12	0.12	0.14	6.8	6.8	6.8				2.82	4.02	2.09
7/12/2012	17.27	18.92	13.57	0.08	0.07	0.10	6.8	6.7	6.7				2.31	3.29	1.71
7/13/2012	21.79	18.47	19.62	0.06	0.07	0.07	6.9	6.9	6.9				2.14	3.04	1.58
7/14/2012															
7/15/2012															
7/16/2012	17.56	17.15	13.19	0.08	0.08	0.10	6.4	6.3	6.4				2.51	3.57	1.86
7/17/2012	15.36	15.46	15.38	0.09	0.09	0.09	6.5	6.5	6.5				2.61	3.71	1.93
7/18/2012	14.20	15.18	11.60	0.09	0.09	0.11	6.5	6.5	6.5				2.38	3.38	1.76
7/19/2012	16.67	18.03	15.32	0.08	0.07	0.09	6.6	6.5	6.5				2.27	3.24	1.68
7/20/2012	17.05	17.03	16.57	0.08	0.08	0.08	6.7	6.8	6.8	102.4	102.4	100.2	2.27	3.24	1.68
7/21/2012															
7/22/2012															
7/23/2012	16.11	16.37	13.29	0.08	0.08	0.10	6.5	6.6	6.6	84.6	86.6	84.2	2.34	3.33	1.73
7/24/2012	16.85	17.44	13.30	0.08	0.08	0.10	6.5	6.5	6.5				2.43	3.46	1.80
7/25/2012	19.86	20.60	18.30	0.07	0.06	0.07	6.5	6.5	6.5	94.4	96.2	94.8	2.39	3.40	1.77
7/26/2012	17.63	17.00	14.02	0.08	0.08	0.10	6.8	6.7	6.7				2.25	3.20	1.66
7/27/2012	14.96	16.46	16.49	0.09	0.08	0.08	6.7	6.7	6.7	98.6	95.2	106.4	2.18	3.11	1.62
7/28/2012															
7/29/2012															
7/30/2012	19.20	21.31	18.53	0.07	0.06	0.07	6.5	6.4	6.4	86.8	85.4	83.4	2.05	2.92	1.52
7/31/2012	17.38	16.70	18.50	0.08	0.08	0.07	6.5	6.5	6.5				2.38	3.39	1.76
Minimum	8.04	9.69	7.71	0.06	0.06	0.07	6.4	6.3	6.4	84.6	85.4	83.4	2.05	2.92	1.52
Maximum	21.79	21.31	19.62	0.17	0.14	0.17	6.9	6.9	6.9	102.4	102.4	106.4	3.58	5.10	2.65
Average	16.35	16.70	14.55	0.09	0.08	0.10	6.6	6.6	6.6	93.4	93.2	93.8	2.39	3.41	1.77

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

DEPT. OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)

Piedmont Regional Office
4949-A Cox Road

Glen Allen, VA 23060

PERMITTEE NAME/ADDRESS (INCLUDE FACILTY NAME/LOCATION IF DIFFERENT)

NAME: Falling Creek WWTP
ADDRESS: Dept of Public Utilities
Chesterfield, VA 23832

FACILITY LOCATION:

VA0024996	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2012	07	01	TO	2012	07	31

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM.

Parameter		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX.	FREQUENCY OF ANALYSIS	SAMPLE TYPE	LAB CODE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS				
FLOW	REPORTD	7.64	11.33	MGD	*****	*****	*****		0	CONT	CONT	VA00935
PARAM CODE: 001	REQRMNT	10.1	NL		*****	*****	*****			CONT	TIRE	
PH	REPORTD	*****	*****		6.7	*****	7.2	SU	0	1/DAY	GRAB	VA00935
PARAM CODE: 002	REQRMNT	*****	*****		6.0	*****	9.0			1/DAY	GRAB	
CL2, TOTAL	REPORTD	*****	*****		*****	3	8	UG/L	0	1/2H	GRAB	VA00935
PARAM CODE: 005	REQRMNT	*****	*****		*****	64	79			1/DAY	GRAB	
DO	REPORTD	*****	*****		7.9	*****	*****	MG/L	0	1/DAY	GRAB	VA00935
PARAM CODE: 007	REQRMNT	*****	*****		6.0	*****	*****			4D/W	GRAB	
PHOSPHORUS, TOTAL (AS P)	REPORTD	27.7	*****	KG/D	*****	0.91	*****	MG/L	0	1/W	24HC	VA01002
PARAM CODE: 012	REQRMNT	76	*****		*****	2.0	*****			1/W	24HC	
E.COLI	REPORTD	*****	*****		*****	5	*****	N/CML	0	4/M	GRAB	VA01002
PARAM CODE: 120	REQRMNT	*****	*****		*****	126	*****			2/M	GRAB	
CL2, TOTAL CONTACT	REPORTD	*****	*****		0.07	*****	*****	MG/L	8	1/2H	GRAB	VA00935
PARAM CODE: 157	REQRMNT	*****	*****		1.0	*****	*****		36	1/2H	GRAB	

GENERAL PERMIT REQUIREMENTS OR COMMENTS:
PARAMETER-SPECIFIC COMMENTS:

BYPASSES AND OVERFLOWS	TOTAL OCCURENCES	TOTAL FLOW (M.G.)	TOTAL BOD5(K.G.)
	0	0	0

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS TO THE BEST OF MY KNOWLEDGE AND BELIEF TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS. SEE 18 U.S.C. & 1001 AND 33 U.S.C. & 1319. (Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)

OPERATOR IN RESPONSIBLE CHARGE					
Scott B. Smedley		1965007932			
TYPED OR PRINTED NAME		CERTIFICATE NUMBER			
PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		TELEPHONE	804-768-7272		
TYPED OR PRINTED NAME	SIGNATURE		YEAR	MO.	DAY

Page 1

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

DEPT. OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)

Piedmont Regional Office
4949-A Cox Road

Glen Allen, VA 23060

PERMITTEE NAME/ADDRESS (INCLUDE FACILTY NAME/LOCATION IF DIFFERENT)

NAME Falling Creek WWTP
ADDRESS Dept of Public Utilities
Chesterfield, VA 23832

FACILITY LOCATION

VA0024996	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2012	07	01	TO	2012	07	31

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM.

Parameter		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX.	FREQUENCY OF ANALYSIS	SAMPLE TYPE	LAB CODE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS				
CL2, INST TECH MIN LIMIT	REPORTD	*****	*****		0.07	*****	*****	MG/L	1	1/2H	GRAB	VA00935
PARAM CODE: 213	REQRMNT	*****	*****		0.60	*****	*****		0	1/2H	GRAB	
CBOD5, JUN-OCT	REPORTD	<QL	<QL	KG/D	*****	<QL	<QL	MG/L	0	1/W	24HC	VA01002
PARAM CODE: 315	REQRMNT	611	917		*****	16.0	24.0			1/W	24HC	
TSS, JUN-OCT	REPORTD	11.0	43.9	KG/D	*****	0.3	1.3 1.0	MG/L	0	1/W	24HC	VA01002
PARAM CODE: 316	REQRMNT	611	917		*****	16.0	24.0			1/M	24HC	
AMMONIA, AS N JUN-OCT	REPORTD	<QL	<QL	KG/D	*****	<QL	<QL	MG/L	0	1/W	24HC	VA01002
PARAM CODE: 318	REQRMNT	244	367		*****	6.4	9.6			1/W	24HC	
NITROGEN, TOTAL (AS N) (YEAR-TO-DATE)	REPORTD	*****	*****		*****	3.96	*****	MG/L	0	1/M	CALC	VA01002
PARAM CODE: 805	REQRMNT	*****	*****		*****	NL	*****			1/M	CALC	

GENERAL PERMIT REQUIREMENTS OR COMMENTS:
PARAMETER-SPECIFIC COMMENTS:

BYPASSES AND OVERFLOWS	TOTAL OCCURENCES	TOTAL FLOW (M.G.)	TOTAL BOD5(K.G.)
	0	0	0

OPERATOR IN RESPONSIBLE CHARGE

Scott B. Smedley	1965007932
TYPED OR PRINTED NAME	CERTIFICATE NUMBER

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS TO THE BEST OF MY KNOWLEDGE AND BELIEF TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS. SEE 18 U.S.C. & 1001 AND 33 U.S.C. & 1319. (Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)

PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		TELEPHONE	804-768-7272		
TYPED OR PRINTED NAME	SIGNATURE		YEAR	MO.	DAY

COMMONWEALTH OF VIRGINIA - DEPARTMENT OF ENVIRONMENTAL QUALITY

GENERAL PERMIT FOR TOTAL NITROGEN AND TOTAL PHOSPHORUS DISCHARGES AND NUTRIENT TRADING IN THE CHESAPEAKE BAY WATERSHED IN VIRGINIA

DISCHARGE MONITORING REPORT (DMR)

Piedmont Regional Office AUG 10 2012 RECEIVED

NAME	Chesterfield County Aggregate Nutrient Discharge
ADDRESS:	Department of Utilities 9840 Government Center Parkway - P.O. Box 608 Chesterfield VA 23832-0009
FACILITY LOCATION	Falling Creek WWTP

VAN040080	501
PERMIT NUMBER	OUTFALL NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2012	7	1	TO	2012	7	31

DEPT. OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road
Glen Allen, Virginia 23060-6296
Telephone: # (804) 527-5020

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO EX.	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
001 Flow	REPORTED	7.64	**********	MGD	**********	**********	**********			CONT	REC
	PERMIT REQUIREMENT	NL	**********		**********	**********	**********			CONT	REC
012 PHOSPHORUS, TOTAL (AS P)	REPORTED	**********	**********		**********	0.91	**********	MG/L		1/W	24 HC
	PERMIT REQUIREMENT	**********	**********		**********	NL	**********			1/W	24 HC
013 NITROGEN, TOTAL AS N	REPORTED	**********	**********		**********	3.92	**********	MG/L		1/W	24 HC
	PERMIT REQUIREMENT	**********	**********		**********	NL	**********			1/W	24 HC
068 TKN (N-KJEL)	REPORTED	**********	**********		**********	0.58	**********	MG/L		1/W	24 HC
	PERMIT REQUIREMENT	**********	**********		**********	NL	**********			1/W	24 HC
389 NITRITE+NITRATE-N, TOTAL	REPORTED	**********	**********		**********	3.34	**********	MG/L		1/W	24 HC
	PERMIT REQUIREMENT	**********	**********		**********	NL	**********			1/W	24 HC
791 NITROGEN, TOTAL AS N (MONTHLY LOAD)	REPORTED	**********	7,781	LB/MO	**********	**********	**********			MONTH	CALC
	PERMIT REQUIREMENT	**********	NL		**********	**********	**********			MONTH	CALC
793 PHOSPORUS, TOTAL (AS P) (MONTHLY LOAD)	REPORTED	**********	1,891	LB/MO	**********	**********	**********			MONTH	CALC
	PERMIT REQUIREMENT	**********	NL		**********	**********	**********			MONTH	CALC

ADDITIONAL PERMIT REQUIREMENT OR COMMENTS

BYPASSES AND OVERFLOWS	TOTAL OCCURRENCES	TOTAL FLOW (MG)	TOTAL BODS (KG)
	0	0	0

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. & 1001 AND 33 U.S.C. & 1319. (Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)

OPERATOR IN RESPONSIBLE CHARGE			DATE		
Scott B. Smedley		1965007932	2012	8	6
TYPED OR PRINTED NAME	SIGNATURE	CERTIFICATE NO.	YEAR	MO.	DAY
PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT			DATE		
George Hayes		(804) 318-8372	2012	8	6
TYPED OR PRINTED NAME	SIGNATURE	AREA CODE/ NUMBER	YEAR	MO.	DAY

FC Falling Creek Wastewater Treatment Plant - July 2012

Date	Flow	Settleable Solids			D.O.	Suspended Solids				Date	Flow	BOD	C-BOD	BOD	BOD	Chlorine
	Total MGD	Max.MGD	Inf.	Eff.	Eff.	Inf.	Eff.	% Red.	kg/day		Total MGD	Inf.	Eff.	%Red.	kg/day	Total lbs.
1	10.49	11.43			8.0					1	10.49					767
2	11.33	13.35	11.0	0.0	8.2	132				2	11.33					682
3	7.75	12.50	11.0	0.0	8.2	141				3	7.75					596
4	6.80	7.68			8.3					4	6.80					512
5	6.72	7.03	8.5	0.0	8.1	169	0	100.0	0.0	5	6.72	214	0	100.0	0.0	469
6	7.04	7.93	10.0	0.0	7.9	171				6	7.04					554
7	7.27	7.69			8.0					7	7.27					597
8	7.48	7.72			8.0					8	7.48					596
9	6.87	7.85	10.0	0.0	8.1	217				9	6.87					554
10	7.50	8.35	9.0	0.0	8.2	149				10	7.50					554
11	8.93	9.82	4.5	0.0	8.2	160	1 1.3	99.2	43.9	11	8.93	188	0	100.0	0.0	768
12	7.32	9.40	12.0	0.0	8.3	167				12	7.32					512
13	6.76	7.20	6.0	0.0	8.3	163				13	6.76					596
14	7.03	7.46			8.2					14	7.03					511
15	7.80	8.78			8.2					15	7.80					596
16	7.93	8.53	6.0	0.0	8.4	161				16	7.93					554
17	8.25	8.79	5.5	0.0	8.0	102				17	8.25					639
18	7.52	8.39	8.5	0.0	8.2	160	0	100.0	0.0	18	7.52	185	0	100.0	0.0	554
19	7.19	7.78	8.0	0.0	8.1	168				19	7.19					554
20	7.19	7.53	9.5	0.0	8.1	151				20	7.19					639
21	7.69	8.34			8.2					21	7.69					639
22	8.09	8.84			8.2					22	8.09					554
23	7.40	7.85	11.0	0.0	8.3	151				23	7.40					341
24	7.68	8.05	10.0	0.0	8.3	126				24	7.68					426
25	7.55	8.04	9.0	0.0	8.2	169	0	100.0	0.0	25	7.55	179	0	100.0	0.0	512
26	7.11	7.30	10.0	0.0	8.1	139				26	7.11					426
27	6.91	7.21	8.0	0.0	8.0	165				27	6.91					597
28	7.15	7.84			8.1					28	7.15					511
29	8.07	8.57			8.1					29	8.07					469
30	6.49	8.35	10.0	0.0	8.2	184				30	6.49					426
31	7.54	7.87	8.0	0.0	8.2	168				31	7.54					512
Total	236.85	263.47	185.5	0.0	252.9	3313.0	1.0	399.2	43.9	Total	236.85	764.5	0.0	400.0	0.0	17217.0
Average	7.64	8.50	8.8	0.0	8.2	157.8	0.3	99.8	11.0	Average	7.64	191.1	0.0	100.0	0.0	555.4
Minimum	6.49	7.03	4.5	0.0	7.9	102.0	0.0	99.2	0.0	Minimum	6.49	178.5	0.0	100.0	0.0	341.0
Maximum	11.33	13.35	12.0	0.0	8.4	217.0	1.0	100.0	43.9	Maximum	11.33	214.0	0.0	100.0	0.0	768.0
WK1 AVG	8.20	9.66					0.0		0.0	WK1 AVG	8.20		0.0		0.0	
WK2 AVG	7.41	8.26					1.0		43.9	WK2 AVG	7.41		0.0		0.0	
WK3 AVG	7.65	8.31					0.0		0.0	WK3 AVG	7.65		0.0		0.0	
WK4 AVG	7.41	7.88					0.0		0.0	WK4 AVG	7.41		0.0		0.0	

Falling Creek Wastewater Treatment Plant - July 2012

Sodium Bisulfite		Date	Aeration Basin #1			Digester #1			Sec. Digester				pH	pH Min.	pH Max.	Date	Flow	Total
Avg.Res.	Total lbs.		D.O.	MLSS	% Sett.	SVI	Vol.Acid	Alkal.	pH	Vol.Acid	Alkal.	pH	Inf.	Eff.	Eff.		Total MGD	Nit.
1.8	305	1													7.0	1	10.49	
1.6	244	2		2890	24.0	83							7.0		6.9	2	11.33	2.47
1.5	122	3		3640	31.0	85							7.1		6.9	3	7.75	
1.5	122	4													7.2	4	6.80	
1.6	183	5		3140	35.0	111	285	2603	7.1	175	2728	7.2	7.1		7.0	5	6.72	
1.6	244	6		3680	28.0	76							7.0		6.9	6	7.04	
1.6	244	7													7.0	7	7.27	
1.4	122	8													7.1	8	7.48	
1.6	122	9		3280	25.0	76							7.0		7.1	9	6.87	3.90
1.6	122	10		2980	23.0	77							7.0		7.1	10	7.50	
1.7	122	11		2960	21.0	71							7.2		7.0	11	8.93	
1.5	122	12		3010	25.0	83	155	1947	7.0	160	2409	7.2	6.9		7.0	12	7.32	
1.5	183	13		3300	27.0	82							7.1		7.0	13	6.76	
1.7	122	14													7.2	14	7.03	
1.6	183	15													7.2	15	7.80	
1.6	122	16		3120	27.0	87							6.9		7.2	16	7.93	4.22
1.6	122	17		2840	25.0	88							7.1		7.0	17	8.25	
1.5	244	18		2990	29.0	97							7.1		7.0	18	7.52	
1.5	122	19		2910	30.0	103	127	1907	7.0	139	2255	7.2	7.1		7.0	19	7.19	
1.5	122	20		3090	28.0	91							7.0		7.2	20	7.19	
1.7	122	21													7.2	21	7.69	
1.6	122	22													7.1	22	8.09	
1.5	122	23		2950	29.0	98							7.0		6.9	23	7.40	4.15
1.5	122	24		3020	30.0	99							7.1		6.8	24	7.68	
1.6	122	25		3150	33.0	105							7.2		7.2	25	7.55	
1.5	183	26		3160	30.0	95	130	1764	6.8	147	1962	7.0	6.9		7.1	26	7.11	
1.5	122	27		2750	30.0	109							7.0		7.1	27	6.91	
1.5	183	28													7.1	28	7.15	
1.7	244	29													7.0	29	8.07	
1.6	122	30		3140	30.0	96							6.9		6.7	30	6.49	4.84
1.3	122	31		3120	29.0	93							7.0		7.1	31	7.54	
48.2	4880.0	Total														Total	236.85	19.58
1.6	157.4	Average	#DIV/0!	3101.0	28.0	90.7										Average	7.64	3.92
1.3	122.0	Minimum	0.0	2750.0	21.0	70.9	127	1764	6.8	139	1962	7.0	6.9	0.0	6.7	Minimum	6.49	2.47
1.8	305.0	Maximum	0.0	3680.0	35.0	111.5	285	2603	7.1	175	2728	7.2	7.2	0.0	7.2	Maximum	11.33	4.84
		WK1 AVG														WK1 AVG	8.20	2.47
		WK2 AVG														WK2 AVG	7.41	3.90
		WK3 AVG														WK3 AVG	7.65	4.22
		WK4 AVG														WK4 AVG	7.41	4.15

Falling Creek Wastewater Treatment Plant - July 2012

Loading kg/day	TKN	Loading kg/day	Ammon.	Loading kg/day	Nitrite+ Nitrate-N	Loading kg/day	Ortho Phos.	Loading kg/day	Total Phos.	Loading kg/day
105.9	0.00	0.0	0.00	0.0	2.47	105.9			0.96	41.2
101.4	0.70	18.2	0.00	0.0	3.20	83.2			0.89	23.1
126.7	0.70	21.0	0.00	0.0	3.52	105.7			0.87	26.1
116.2	0.76	21.3	0.00	0.0	3.39	95.0			0.86	24.1
118.9	0.73	17.9	0.00	0.0	4.11	101.0			0.97	23.8
569.1	2.89	78.4	0.00	0.0	16.69	490.7	0.00	0.0	4.55	138.3
113.8	0.58	15.7	0.00	0.0	3.34	98.1	#DIV/0!	#DIV/0!	0.91	27.7
101.4	0.00	0.0	0.00	0.0	2.47	83.2	0.00	0.0	0.86	23.1
126.7	0.76	21.3	0.00	0.0	4.11	105.9	0.00	0.0	0.97	41.2
105.9	0.00	0.0	0.00	0.0	2.47	105.9	#DIV/0!	#DIV/0!	0.96	41.2
101.4	0.70	18.2	0.00	0.0	3.20	83.2	#DIV/0!	#DIV/0!	0.89	23.1
126.7	0.70	21.0	0.00	0.0	3.52	105.7	#DIV/0!	#DIV/0!	0.87	26.1
116.2	0.76	21.3	0.00	0.0	3.39	95.0	#DIV/0!	#DIV/0!	0.86	24.1

Chesterfield County, Virginia
Utilities Department
Proctors Creek Wastewater Treatment Plant Laboratory
1200 Coxendale Road, Chester, VA 23836
Phone: (804) 768-7272 – Fax: (804) 748-4692 – Internet: chesterfield.gov

ROY E. COVINGTON
Director

Results of *E. coli* Analysis

Method: EPA approved HACH m-ColiBlue24

Month: July 2012 **Plant: Falling Creek** **Permit #: VA0024996**

Date Collected	Flow Rate	Chlorine Residual	Results CFU/100 mL
9	6.60	1.06	<1
16	7.70	1.63	<1
17	8.20	0.07	730
23	7.39	1.05	1

Geometric Mean= 5 CFU/100 mL

Attachment E

1992 Model of Mixing Conditions

February 19, 1992

M E M O

TO: M. Dale Phillips

FROM: Winston Lung W. Lung

RE: Finalized Results of Mixing Zone Analysis of Falling Creek WWTP Effluent

Thank you for your review and comments on my preliminary results of the mixing zone analysis. Per your suggestion on the phone yesterday, I have included the specifications of the allocated impact zone from the Technical Support Document (EPA, 1991). The modeling methodology that you accepted from my preliminary results was then used to evaluate the acute toxicity limit of 1 TU_a. The model results show that the CMC requirement would be met. Further, a higher toxicity limit of 2 TU_a was also evaluated. The model results indicate that the CMC of 0.3 TU_a could also be met at the edge of the allocated impact zone.

Please let me know if you have any questions or comments regarding this analysis. I can be reached at (804) 924-3722. Also enclosed is a copy of the model which I developed for this study. A README file is included to provide instructions. The program requires a math co-processor and a VGA monitor (either color or monochrome).

cc: Allan Brockenbrough, II (SWCB Piedmont Office)
OWRM - Toxics

CHESTERFIELD COUNTY
P.O. Box 40
CHESTERFIELD, VIRGINIA 23832-0040

February 25, 1992

Mr. Allan Brockenbrough
State Water Control Board
Piedmont Regional Offices
4900 Innsbrook Corporate Center
P.O. Box 11143
Richmond, VA 23230

Re: Falling Creek WWTP VPDES Permit
#VA0024996

Dear Mr. Brockenbrough:

The mixing zone modeling of the Falling Creek Wastewater Treatment Plant outfall performed by Dr. Wu-Seng Lung, indicates that the proposed acute toxicity limit could be increased to 2 TU without causing lethality in the receiving stream. An acute toxicity limit of 2 TU is equivalent to an LC 50 of 50% effluent.

We have again reviewed all available acute toxicity data to determine the number of tests exhibiting LC 50 values of less than 50% effluent. Of the twenty six tests using pimephales promelas all LC 50 values were greater than 50%. Only one of the six tests conducted on the plant effluent, during the TRE, using ceriodaphnia dubia exhibited an LC 50 of less than 50% (83.3% compliance).

Since the data available indicates the plant effluent is consistently non-toxic, inclusion of an acute toxicity limit in the permit is unnecessary and we request that it not be included in the permit. Your consideration of our request is appreciated.

Very truly yours,

Craig S. Bryant
Assistant Director of Utilities

b:Feb3092.doc

CSB:bw

c: David H. Welchons
Robert A. Talmage
OWRM - Toxics

MIXING ZONE MODELING OF FALLING CREEK POTW OUTFALL

by Wu-Seng Lung

1. Introduction

The new outfall of the Falling Creek POTW is being designed to discharge its effluents into the James River. The impact of the discharge on the aquatic community in the vicinity of the outfall, i.e., the mixing zone is a primary concern. A mixing zone in this case is an area where the effluent discharge undergoes initial dilution and is extended to cover the secondary mixing in the ambient river portion. A mixing zone is an allocated impact zone where acute and chronic water quality criteria can be exceeded as long as a number of protections are maintained (U.S. EPA 1991).

When the wastewater from the Falling Creek POTW is discharged into the James River, its transport may be divided into two stages with distinctive mixing characteristics. Mixing and dilution in the first stage are determined by the initial momentum of the discharge. This initial contact with the receiving water is where the concentration of the effluent will be its greatest in the water column. The design of the discharge outfall should provide ample momentum to dilute the concentrations in the immediate contact area as quickly as possible. The second stage of mixing covers a more extensive area in which the effect of initial momentum is diminished and the waste is mixed primarily by ambient turbulence.

For toxic discharges, U.S. EPA recommends careful evaluation of mixing to prevent zones of chronic toxicity that extend for excessive distances because of poor mixing. U.S. EPA maintains two water quality criteria for the allowable magnitude of toxic substances: a *criterion maximum concentration (CMC)* to protect against acute or lethal effects; and a *criterion continuous concentration (CCC)* to protect against chronic effects.

In rivers or tidal rivers such as the study area in the James River that has a persistent throughflow in the downstream direction and do not exhibit significant natural density stratification, hydrologically based flows 1Q10 and 7Q10 for the CMC and CCC, respectively, have been used traditionally in steady-state mixing zone modeling analysis and will be used in this study.

The Virginia State Water Control Board (SWCB) is proposing an acute toxicity limit of 1 TU_a at the end of the outfall for the Chesterfield WWTP. The analysis presented in the following sections provides data and information to evaluate this limit. This analysis addresses two important questions:

- For the proposed acute toxicity limit, would the CMC to protect against acute or lethal effects be met in the ambient water?
- If yes, could the CMC still be met for a higher toxicity limit?

2. Water Quality Standards

In the recent amendments to the Water Quality Standards proposed by the SWCB, Section VR680-21-01.2.C allows mixing zones. However, no mixing zone established by

the SWCB shall:

- Interfere with passing or drifting aquatic organisms;
- Cause acute lethality to passing or drifting aquatic organisms;
- Be used for, or considered as, a substitute for minimum treatment technology required by the Clean Water Act and other applicable State and Federal laws.
- Constitute more than one-half of the width of the receiving watercourse nor constitute more than one-third of the area of any cross section of the receiving watercourse.
- Extend downstream at any time a distance more than five times the width of the receiving watercourse at the point of discharge.

Further, an allocated impact zone may be allowed within a mixing zone. This zone is the area of initial dilution of the effluent with the receiving water where the concentration of the effluent will be its greatest in the water column. Mixing within these allocated impact zones shall be as quick as practical and shall be sized to prevent lethality to passing aquatic organisms. Mixing zones shall be determined such that ACUTE standards are met outside the allocated impact zone and CHRONIC standards are met at the edge of the mixing zone.

Lethality to passing organisms can be prevented in the mixing zone in one of four ways (U.S. EPA, 1991). The first method is to prohibit concentrations in excess of the CMC in the pipe itself, as measured directly at the end of the pipe. The second method is to use high-velocity discharge with an initial velocity of 3 *m/sec*, or more, together with a mixing zone spatial limitation of 50 times the discharge length scale in any direction. The third alternative is not use a high-velocity discharge. Rather the discharger should provide data to the State regulatory agency showing that the most restrictive of the following conditions are met:

- The CMC should be met within 10% of the distance from the edge of the outfall structure to the edge of the regulatory mixing zone in any spatial direction.
- The CMC should be met within a distance of 50 times the discharge length scale in any spatial direction.
- The CMC should be met within a distance of five times the local water depth in any horizontal direction from any discharge outlet.

A fourth alternative is for the discharger to provide data to the State regulatory agency showing that a drifting organism would not be exposed to 1-hour average concentrations exceeding the CMC, or would not receive harmful exposure when evaluated by other valid toxicological analysis.

3. Study Approach

Data from the study area have suggested that the first two methods of preventing lethality are not applicable to the Falling Creek WWTP outfall. The current design of the proposed outfall structure does not offer high-velocity discharge. The study effort is therefore focused on alternative 3, providing data and information to the State, expecting that CMC can be met within the mixing zone as required.

In the study area, the proposed Falling Creek outfall is a surface discharge into a tidal river. At the present time, there is no analytical methods, including numerical models to adequately address this discharge configuration in tidal waters. The CORMIX1 model (U.S. EPA 1991) is only applicable to submerged bottom discharges.

Following a meeting with the staff of Virginia on January 10, 1992, a conservative approach of analysis was adopted. That is, the CORMIX1 modeling exercise would be bypassed at the present time, thus neglecting discharge-induced mixing. As such, no credit is given for the momentum-induced mixing; mixing between the effluent and the river water is achieved only by turbulent mixing in the ambient water. Such an assumption is viewed conservative. Further, the effluent being modeled is assumed to be a conservative substance, given the spatial and temporal scales associated with the mixing zone.

To assist the analysis of the ambient induced mixing zone, dye dispersion studies are usually used to calibrate the mixing characteristics in the receiving water. In the field work, the Rhodamine WT dye is released with the effluent which in turn is discharged into the receiving water. However, such a field study is not appropriate for a non-existing outfall. A discussion with the SWCB staff on this issue led to an analytical approach, using literature data on the mixing coefficients in tidal rivers instead. Further, results from recent hydrodynamic modeling of the James Estuary by the Virginia Institute of Marine Science (VIMS) would be used to develop the dispersion coefficients for the study area. Such an approach would be substantiated by model sensitivity analyses of the dispersion coefficients in the study area.

4. Two-Dimensional Mass Transport Model

Fischer *et al.* (1979) presented the following two-dimensional mass transport model for ambient mixing in rivers:

$$C(x,y) = \frac{M}{du(4\pi D_y x/u)^{1/2}} \exp\left(\frac{-y^2 u}{4D_y x}\right) \qquad (1)$$

where

C = concentration at any given location
M = mass discharged / unit time
u = average velocity in the river
D_y = dispersion coefficient across the river
x = distance downstream from the diffusers
y = distance in lateral direction
d = average depth in the river

It should be pointed out that the James River near Falling Creek is still under tidal influence, resulting in longitudinal dispersion (spread) of the effluent. Thus, Eq. 1 must be modified to incorporate the longitudinal spread along the James River.

Hamrick and Neilson (1989) developed a simplified, analytical solution to track the fate and transport of pollutants in estuaries in a two-dimensional configuration. For the study area where the river is sufficiently wide with respect to the discharge of a conservative effluent, Hamrick and Neilson's solution may be approximated by the following expression for a conservative substance:

$$C = \frac{M}{\pi d\,(D_x D_y)^{1/2}} \exp\left(\frac{u x}{2 D_x}\right) K_0 \left[\frac{u}{2 D_x^{1/2}} \left(\frac{x^2}{D_x} + \frac{y^2}{D_y}\right)^{1/2}\right] \qquad (2)$$

where

D_x is the longitudinal dispersion coefficient and
K_0 is the modified Bessel function of the second kind of order zero.

Equation 2 represents a modification of Eq. 1 by incorporating the longitudinal dispersion in a tidal river and is used in this study to quantify the far-field mixing.

5. Data Analysis

5.1 Effluent Characteristics

The design flow of the Falling Creek WWTP is 10 *mgd* at the present time and this flow is used in the mixing zone calculation.

A toxicity unit is used to represent the toxicity level of the effluent. The acute toxicity unit is defined as:

$$TU_a = \frac{100}{LC_{50}} \tag{3}$$

where LC_{50} is the percent effluent that causes 50 percent of the organisms to die by the end of the acute exposure period. For example, an effluent with an acute toxicity of and LC_{50} in 5% effluent is an effluent containing 20 TU_as. At the present time, the SWCB proposes an effluent toxicity limit of 1 TU_a for the Chesterfield WWTP.

5.2 1Q10 Low Flow

The SWCB interprets its narrative criteria for whole effluent toxicity to require that the technical support document recommendations of 0.3 TU_a be used as the numeric value for acute toxicity. Accordingly, the CMC applies under the 1Q10 low flow. The 1Q10 low flow for this study was obtained from Mr. Charles Martin of SWCB. The unregulated annual 1Q10 flow at Cartersville is 515 *cfs*. The similar flow at Richmond may be derived by multiplying the 1Q10 low flow at Cartersville by the ratio of drainage areas (1.08). Thus, the unregulated annual 1Q10 flow at Richmond is approximately 556 *cfs*. Additional flow resulting from the low flow augmentation program could add another 49 *cfs*, yielding a 1Q10 low flow of 605 *cfs* for this analysis (Martin, 1992). It should be pointed out that a small incremental flow between Richmond and the study area near Falling Creek has not been accounted for. Thus, 605 *cfs* is a conservative estimate of the 1Q10 low flow.

5.3 Potential for Excursions

At the 1Q10 flow of 605 *cfs* and the effluent flow of 10 *mgd* (= 15.47 *cfs*), the maximum dilution is: (605 + 15.5)/15.5 = 40. That is, when the effluent is completely mixed with the river flow, the maximum dilution ratio would be about 40. The receiving water concentration for acute toxicity for comparison with the CMC is calculated to be:

$$C = \frac{1.0\ TU_a}{40} = 0.025\ TU_a$$

The value of the calculated receiving water concentration, 0.025 TU_a, is less than the acute water quality standard of 0.3 TU_a, and therefore there is no reasonable potential for the CMC to be exceeded.

5.4 Dimensions of the Allocated Impact Zone

The dimensions of the allocated impact zone within which the CMC is met depends on the size of the regulatory mixing zone as specified in the State Water Quality Standards. In this analysis, they are calculated in the following steps:

1. The length of the regulatory mixing zone = 2,700 *ft* (5 times the river width)
2. The width of the regulatory mixing zone = 270 *ft* (one-half of the river width)
3. The CMC should be met within 10% of the lateral distance from the edge of the outfall structure to the edge of the mixing zone = 27 *ft* (10% of 270 *ft*)
4. The CMC should be met within a distance of 50 times the discharge length scale in any spatial direction = 150 *ft* (50 times the outfall pipe diameter of 3 *ft*)
5. The CMC should be met within a distance of five times the local water depth = 125 *ft* (5 times 25 *ft*)

Based on the above limitations, the size of the allocated impact zone is 27 *ft* by 125 *ft*. As such, the CMC should be met at the edge of this zone.

5.5 Hydraulic Geometry and Ambient Mixing Coefficients

Figure 1 shows the cross-sectional area (= 13,345 ft^2) in the study area under mean tide conditions. The average depth is 24.9 *ft*. Under the 1Q10 low flow of 605 *cfs* in the study area, the average velocity is 0.045 *ft/sec*.

Longitudinal and lateral dispersion coefficient values need to be assigned. To assist the selection, a range of longitudinal and lateral dispersion coefficients used by Hamrick and Neilson (1989) for several marinas along the James River Estuary is listed in Table 1.

Table 1. Longitudinal and Lateral Dispersion Coefficients[1]

Site	Receiving Water	D_x (ft^2/s)	D_y (ft^2/s)
Garrett's Marina	Rappahannock River	247	0.32
South Hill Banks Marina	Rappahannock River	247	0.32
Ingram Bay Marina	Ingram Bay	0.014	0.002
Cranes Creek	Ingram Bay	0.32	0.007
A.C. Fisher Marina	Cranes Creek	0.36	0.006
James River STP	James Estuary	172	0.12
York River STP	York Estuary	150	0.62

1. from Hamrick and Neilson (1989)

Further, results from the hydrodynamic model of the James Estuary by Hamrick (1992) were obtained and the following dispersion coefficients were derived for the study area: D_x = 10 ft^2/sec and D_y = 1.0 ft^2/sec. The longitudinal dispersion coefficient value

selected is much smaller than those for the two STPs in the James River in Table 1. It should be pointed out that both the James Estuary and York Estuary sites in Table 1 are close to the mouths of these two rivers, subject to significant tidal actions. While the receiving water in the Falling Creek area is tidal, the tidal influence is diminished significantly, resulting in small longitudinal mixing. Another component in the longitudinal dispersion coefficient is the compensation from spatial averaging. In the two-dimensional model such as Eq. 2, no lateral averaging is allowed. The only spatial averaging is in the vertical direction. The study area is located very close to the fall line and the vertical gradients of horizontal velocity is relatively small, somewhat similar to the vertical profile usually observed in a rivering system. As such, the second component contributing to longitudinal dispersion is also small in the study area.

Although the lateral dispersion coefficient of 1.0 ft^2/sec selected for this analysis is slightly greater than most of the reported values in Table 1, it is consistent with some other literature values of lateral mixing coefficients in rivers as listed in Table 2.

Table 2. Summary of Lateral Dispersion Coefficients

Data Source	River Width (ft)	D_y (ft^2/sec)
Yotsukura and Cobb (1972) Missouri River near Blair	600	1.087
Beltaos (1978a) Athabasca below Ft. McMurray	1,220	0.990
Beltaos (1978b) Bow River at Calgary	340	0.914

6. Model Application

6.1 Evaluation of Acute Toxicity Limit of 1 TU_a

Equation 2 is applied with the following data:

- Total wastewater flow = 10 mgd
- Effluent acute toxicity = 1.0 TU_a
- River velocity = 0.045 ft/sec
- Longitudinal dispersion coefficient = 10 ft^2/sec
- Lateral dispersion coefficient = 1.0 ft^2/sec
- River depth = 24.9 ft

The model results are shown in Figure 2 in which five (5) isopleth toxicity contours are displayed. Contour No. 1 has a toxicity of 0.3 TU_a and contour No. 5 represents the toxicity level of complete mixing (i.e., 0.025 TU_a). The other three isopleths are 0.033 TU_a, 0.05 TU_a, and 0.10 TU_a, respectively. The model results show that the 0.3 TU_a isopleth would be within the allocated impact zone.

6.2 Model Sensitivity Analysis

Most of the model input parameters associated with Eq. 2 are independently determined. Only the longitudinal and lateral coefficients are indirectly derived and are thereby, subject to certain degrees of uncertainty. Therefore, the model sensitivity analyses of these two parameters are conducted. First, the longitudinal dispersion coefficient, D_x, is varied from 5 ft^2/sec to 20 ft/sec. The model results indicate that the mixing zone calculations are not sensitive to this parameter.

An empirical equation to calculate the lateral dispersion coefficient from Fischer *et al.* (1979) may used to develop the range of the values for a model sensitivity analysis:

$$D_y = \phi\, d\, u^* \tag{4}$$

where

ϕ = an empirical constant ranging from 0.41 to 0.65
u^* = shear velocity (ft/sec)

Using a shear velocity of 0.1 ft/sec which is considered reasonable for the study area and an average depth of 24.9 ft, one could calculate a range of D_y between 1.02 ft^2/sec and 1.495 ft^2/sec. Fischer (1968) reported that higher values of ϕ are usually found near the banks of rivers as in this case. Figure 3 shows the model results associated with D_y = 1.495 ft^2/sec. Again, the higher D_y value offers more rapid mixing between the effluent and the ambient water, resulting in a 0.3 TU_a isopleth closer to the discharge point, when comparing with that in Figure 2. [Note that the results in Figure 2 are based on the low end value of D_y (1.0 ft^2/sec), already on the conservative side!]

6.3 Model Prediction

The ambient mixing model was then used to evaluate a higher effluent toxicity limit, such as 2 TU_a. The results of the model calculations are shown in Figure 4, using the low end value of D_y (1.0 ft/sec). It is seen that the 0.3 TU_a isopleth is still within the allocated impact zone, suggesting that a 50% dilution of the effluent may be allowed.

7. Summary and Conclusions

A mixing zone analysis was performed for the proposed outfall of the Falling Creek WWTP. The foremost question is: whether an acute toxicity limit higher than 1 TU_a could be allowed for the CMC to be met at the edge of the allocated impact zone? First, the potential for excursion of CCC was quantified. The completely mixed concentration in the receiving water is 0.025 TU_a, which is less than the acute water quality standard of 0.3 TU_a.

A two-dimensional mass transport model was applied to calculate the toxicity isopleths in the receiving water. Results from a hydrodynamic model of the James Estuary were used to select the longitudinal and lateral dispersion coefficient values for the mass transport calculation. The dispersion coefficient values used were found to be consistent with literature data, given the receiving water conditions for this study. Model sensitivity analyses indicated that the results are not sensitive to reasonable variations of the longitudinal dispersion coefficient. Instead, they are sensitive to the lateral dispersion coefficient. Nevertheless, the calculated 0.3 TU_a isopleths are well within the allocated impact zone, suggesting that a higher toxicity limit could be achieved.

Finally, the model prediction results indicated that a 2 TU_a toxicity limit would not cause lethality in the receiving water. That is, the CMC of 0.3 TU_a would still be met at the edge of the allocated impact zone.

References Cited

1. Beltaos, S., 1978a. Mixing processes in natural streams. in *Transport Processes and River Modeling Workshop*. Canada Centre for Inland Waters.
2. Beltaos, S., 1978b. *Transverse Mixing in Natural Streams*. Transportation and Surface Water Eng. Div., Alberta Research Council, Report No. SWE-78/01.
3. EA Eng. Sci. & Tech., Inc., 1987. *Toxicity Reduction Evaluation (TRE) Program for the Falling Creek WWTP*. Report prepared for Chesterfield County Dept. of Utilities, Chesterfield, VA.
4. Fischer, H.B., 1968. Dispersion predictions in natural streams. ASCE *Journal of Sanitary Eng.*, 94(5):927-943.
5. Fischer, H.B., List, E.J., Koh, R.C.Y., Imberger, J., and Brooks, N.H., 1979. *Mixing in Inland and Coastal Waters*. Academic Press, Inc., pp.104-147.
6. Hamrick, J.M., 1992. Personal Communications.
7. Hamrick, J.M. and Neilson, B.J., 1989. *Determination of Maria Buffer Zones Using Simple Mixing and Transport Models*. Report submitted by Virginia Institute of Marine Science for Virginia Department of Health, 68p.
8. Martin, C., 1992. Personal Communication, February 19, 1992.
9. Neely, W.B., 1982. The definition and use of mixing zones. *Environ. Sci. Technol.*, 16(9):518A-521A.
10. U.S. EPA, 1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001, pp.77-79.
11. Yotsukura, N. and Cobb, E.D., 1972. *Transverse Diffusion of Solutes in Natural Streams*. U.S. Geological Survey Professional Paper 582-C.

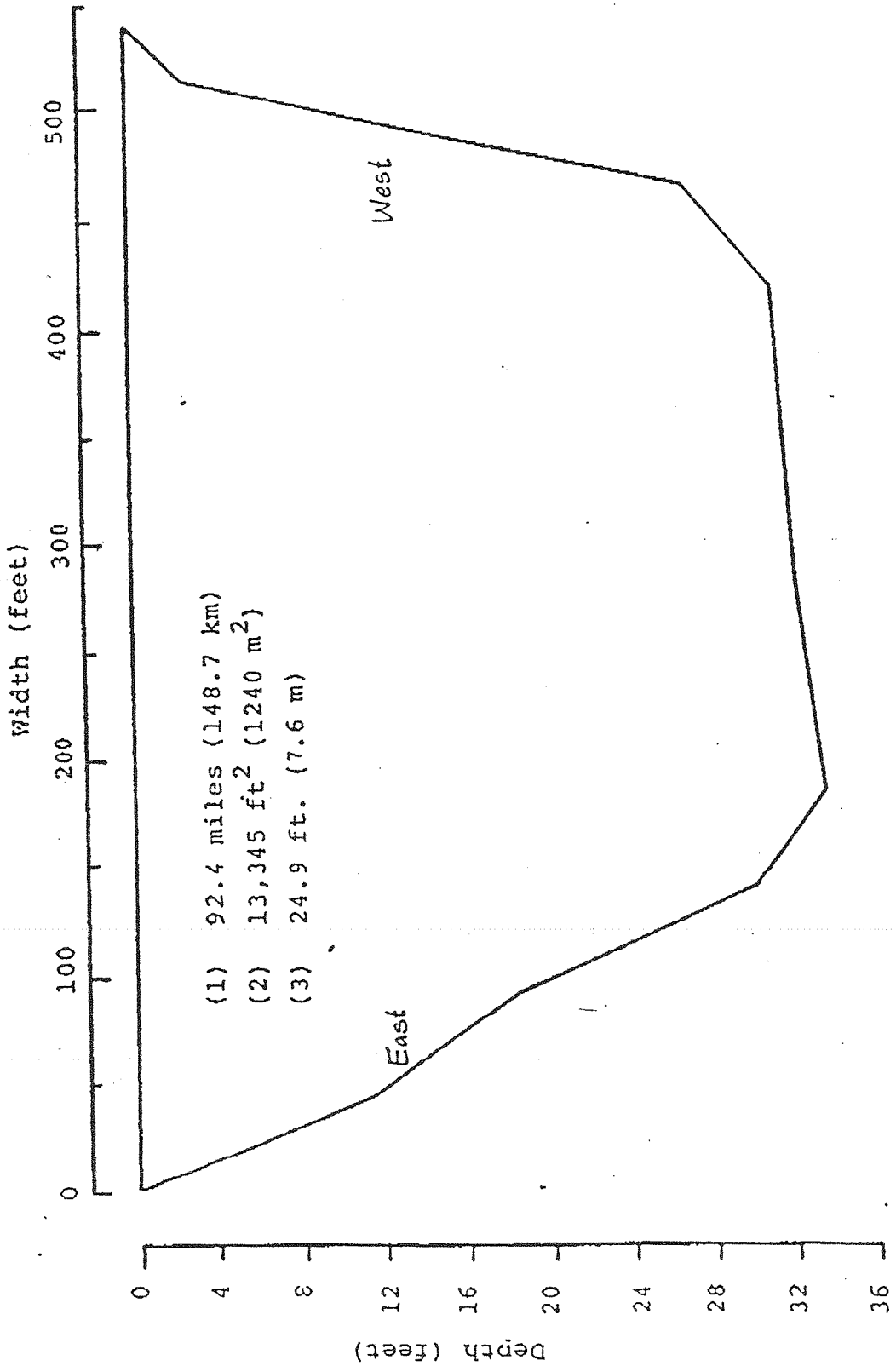


Figure 1. Cross-Sectional Area in the James River near Falling Creek

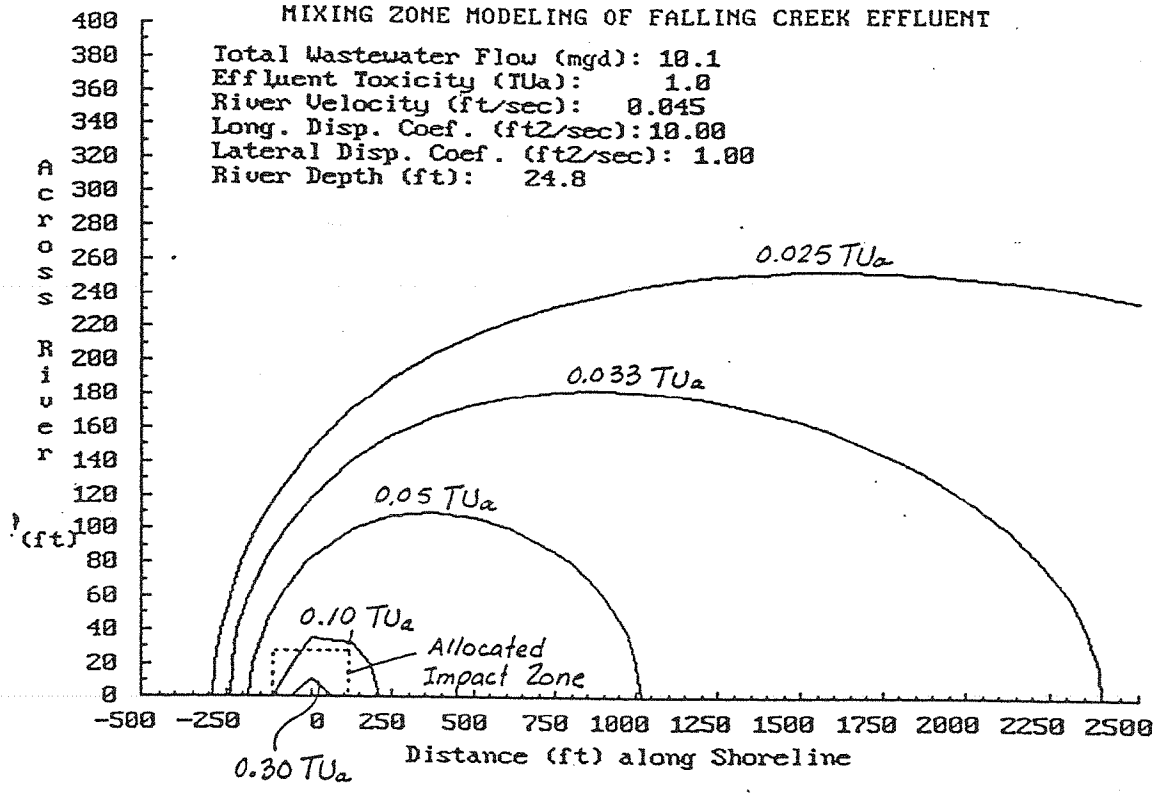


Figure 2. Model Calculated Isopleths for Effluent Toxicity of 1 TU_a ($D_y = 1.0$ *ft/sec*)

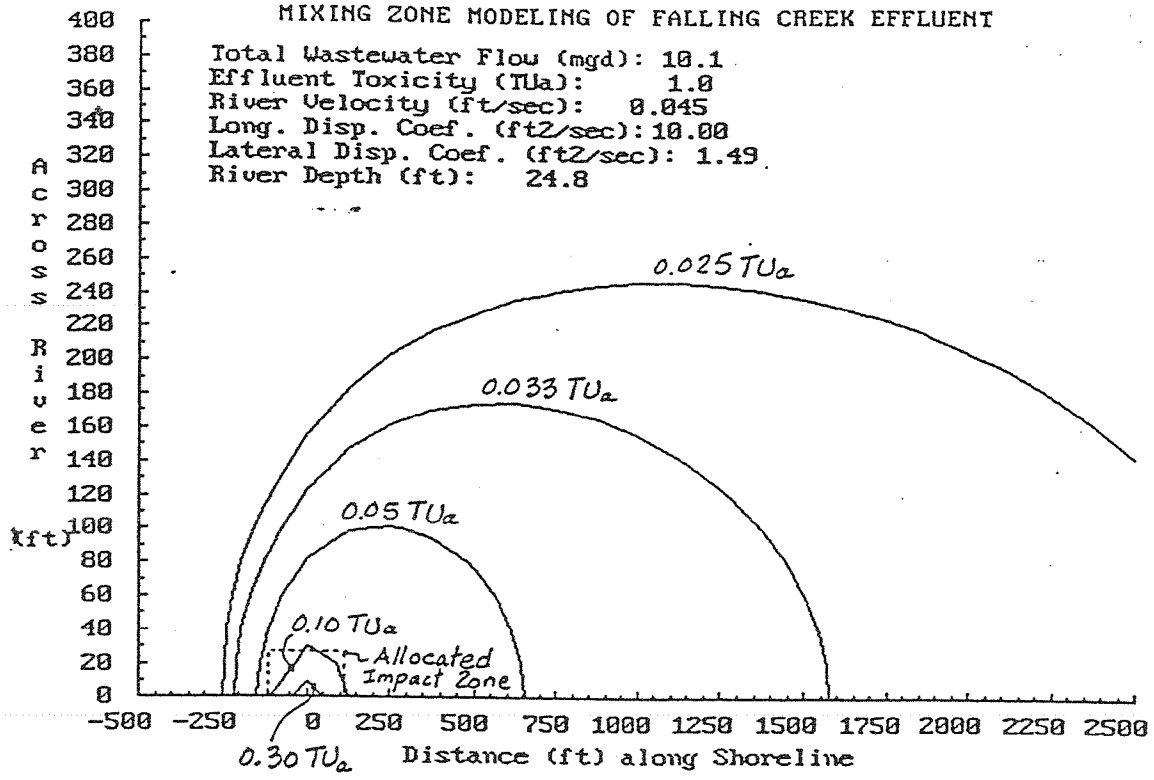


Figure 3. Model Calculated Isopleths for Effluent Toxicity of 1 TU_a (D_y = 1.495 *ft/sec*)

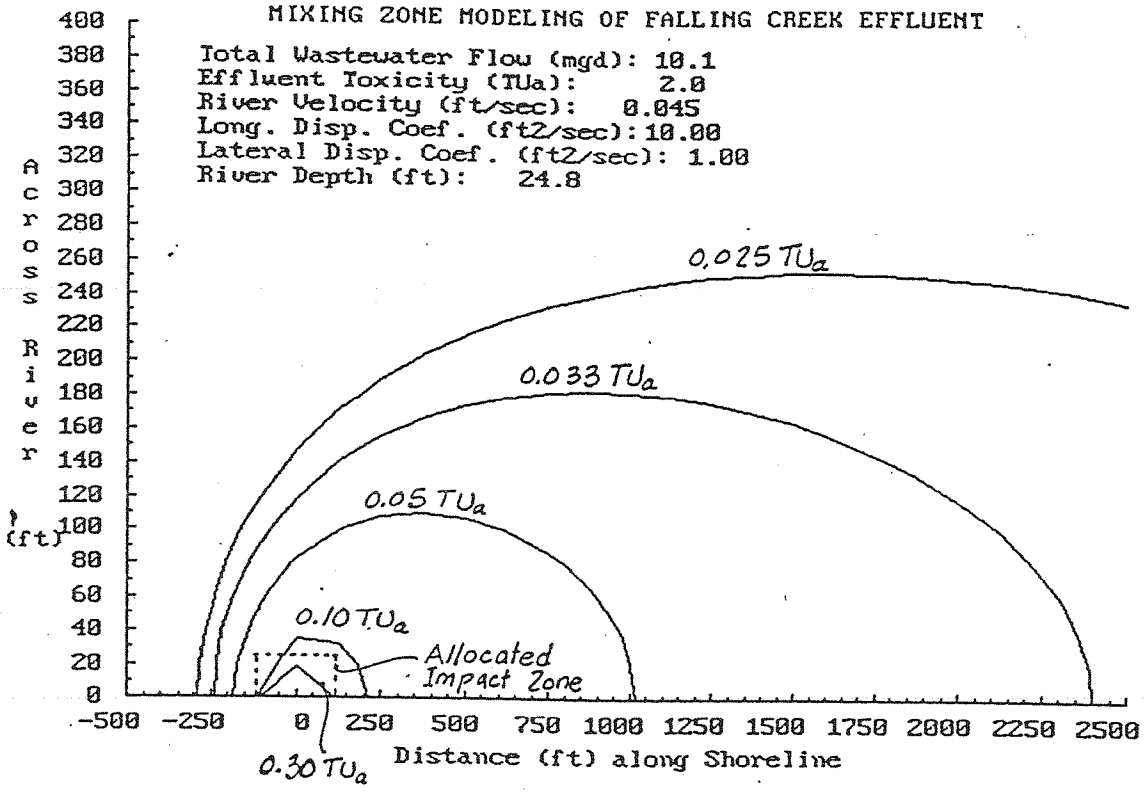


Figure 4. Model Calculated Isopleths for Effluent Toxicity of 2 TU_a ($D_y = 1.0$ *ft/sec*)

2008 Fact Sheet Discussion

Mixing Zone Analysis and Model

The permittee submitted a mixing model for the Falling Creek WWTP discharge to the James River in February 1992 (see **Attachment E**). An allocated impact zone (acute mixing zone) with a width of 27 feet and total length of 250 feet was established. Based on this model, DEQ approved an acute toxicity limitation of 2.0 TUa (i.e. LC_{50} of 50% effluent). Using the equation below, a dilution ratio of 6.67 total parts to 1 part effluent was established for the acute mixing ratio.

$$0.3\text{TUa} = \frac{2.0\text{TUa}}{\text{Dilution Factor}} \qquad \text{Eqn (1)}$$

where 0.3 TUa is the numeric acute water quality standard established in the Technical Support Document for the WET narrative criteria.

Setting the design flow to 1 part and establishing a total flow of 6.67 parts, the Instream Waste Concentration (IWC) at the edge of the acute mixing zone was determined by:

$$\text{IWC} = \frac{\text{Q design}}{\text{Q stream} + \text{Q design}}(100\%) = \frac{1}{6.67}(100\%) = 15\% \qquad \text{Eqn (2)}$$

To achieve that mixing condition in MSTRANTI, the design flow was set to 10.1 MGD and the 1Q10 stream flow was set to 57.27 MGD, as established using the equation below:

$$\frac{1\,\text{part Effluent}}{6.67\,\text{parts Total}} = \frac{\text{Q design}}{\text{Q stream} + \text{Q design}} \qquad \text{Eqn (3)}$$

The mixing zone analysis also established a regulatory mixing zone (RMZ, or chronic mixing zone) with a width of 270 feet and a length of 2700 feet. Revising Eqn (1) above to reflect a chronic criterion of 0.067 TUa results in a calculated dilution factor of 30. Furthermore, Figure 2 of the model suggests that a WET chronic criterion of 0.067 TUa is well within the spatial limitations of the RMZ. Accordingly, a minimum dilution ratio of 30:1 was deemed appropriate, and an IWC at the edge of the RMZ was established at 3.3%. To achieve this mixing condition in MSTRANTI, the design flow was set to 10.1 MGD and the 7Q10 stream flow was set to 292.9 MGD, as established using the chronic mixing ratio 30:1 and the equation above.

As per agency direction, the 30Q5 and harmonic mean flow frequencies were set equivalent to that of the chronic flow frequency.

Current stream data for 1Q10 and 7Q10 flows indicate an increase from those flows on which the model was based. This increase affords the model additional conservatism.

Attachment F

Effluent Limitation Analysis Documents

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001	FLOW (MGD)	6.90	8.04				8-Aug-08
		6.99	15.03				5-Sep-08
		8.24	14.77				10-Oct-08
		6.73	8.38				7-Nov-08
		7.04	10.75				8-Dec-08
		9.26	16.48				8-Jan-09
		7.81	9.64				9-Feb-09
		7.07	8.14				10-Mar-09
		9.95	15.09				8-Apr-09
		8.75	12.31				8-May-09
		8.67	13.66				8-Jun-09
		7.25	9.75				9-Jul-09
		6.63	7.99				10-Aug-09
		6.49	8.20				8-Sep-09
		6.48	8.93				9-Oct-09
		6.23	9.27				9-Nov-09
		10.42	16.15				8-Dec-09
		13.75	17.32				8-Jan-10
		10.13	16.13				9-Feb-10
		12.98	18.30				8-Mar-10
		11.00	15.50				8-Apr-10
		9.2	15.17				7-May-10
		7.08	8.85				8-Jun-10
		6.23	7.40				8-Jul-09
		5.87	6.33				6-Aug-10
		6.66	9.58				7-Sep-10
		5.80	10.89				8-Oct-10
		6.58	10.37				4-Nov-10
		5.96	7.25				8-Dec-10
		8.68	10.74				6-Jan-11
		8.55	10.36				9-Feb-11
		9.10	11.16				8-Mar-11
		9.83	11.67				8-Apr-11
		9.47	11.05				6-May-11
		9.43	11.45				8-Jun-11
		7.45	10.13				8-Jul-11
		9.64	15.16				9-Aug-11
		7.94	12.96				8-Sep-11
		10.53	15.00				6-Oct-11
		8.63	11.53				7-Nov-11
		10.56	15.19				6-Dec-11
		10.33	12.47				5-Jan-12
		8.78	11.62				9-Feb-12
		9.59	12.34				7-Mar-12
		10.49	14.20				5-Apr-12
		8.70	10.63				7-May-12
		8.16	10.16				8-Jun-12
		9.48	10.89				3-Jul-12
		7.64	11.33				6-Aug-12
		7.07	8.19				7-Sep-12
		7.46	9.19				9-Oct-12
		7.30	10.87				8-Nov-12

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001							
	PH (S.U.)				6.7	7.6	8-Aug-08
					6.6	7.5	5-Sep-08
					6.5	7.4	10-Oct-08
					6.7	7.4	7-Nov-08
					6.6	7.4	8-Dec-08
					6.2	7	8-Jan-09
					6.3	7	9-Feb-09
					6.3	7.1	10-Mar-09
					6.2	7	8-Apr-09
					6.2	7.4	8-May-09
					6.1	7.8	8-Jun-09
					6.8	7.6	9-Jul-09
					6.3	7.4	10-Aug-09
					6.4	7.3	8-Sep-09
					6	7.4	9-Oct-09
					6.4	7.3	9-Nov-09
					6	7.6	8-Dec-09
					6	7.2	8-Jan-10
					6	7.4	9-Feb-10
					6	7	8-Mar-10
					6	7.3	8-Apr-10
					6.3	7.1	7-May-10
					6	8.1	8-Jun-10
					6.3	7.4	8-Jul-09
					6.4	7.2	6-Aug-10
					6.5	7.2	7-Sep-10
					6.3	7.2	8-Oct-10
					6.3	7.2	4-Nov-10
					6.2	7.1	8-Dec-10
					6.3	7	6-Jan-11
					6	7.2	9-Feb-11
					6	7.1	8-Mar-11
					6	7	8-Apr-11
					6.3	7.1	6-May-11
					6.3	7.2	8-Jun-11
					6.6	7.4	8-Jul-11
					6.5	7.2	9-Aug-11
					6.3	7.2	8-Sep-11
					6.2	7.2	6-Oct-11
					6.6	7.5	7-Nov-11
					6.4	7.2	6-Dec-11
					6.5	7.3	5-Jan-12
					6.7	7.3	9-Feb-12
					6.6	7.3	7-Mar-12
					6.6	7.2	5-Apr-12
					6.7	7.2	7-May-12
					6.6	7.3	8-Jun-12
					6.9	7.3	3-Jul-12
					6.7	7.2	6-Aug-12
					6.8	7.5	7-Sep-12
					7	7.4	9-Oct-12
					7	7.6	8-Nov-12
				90% Max		7.59	
				10% Max		7.01	
				3 yr. Min:	*6*		
				3 yr. Max:	*8.1*		
				Limit	*6.0 - 9.0*		
			Reduced Monitoring?		*No; minimum is within 0.5 units of limit.*		

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001							
	CL2, TOTAL (µg/L)			<QL		<QL	8-Aug-08
				<QL		<QL	5-Sep-08
				<QL		<QL	10-Oct-08
				<QL		<QL	7-Nov-08
				<QL		<QL	8-Dec-08
				<5		<5	8-Jan-09
				<1		2	9-Feb-09
				1.3		3.5	10-Mar-09
				<1		1	8-Apr-09
				6		8	8-May-09
				7.8		10.5	8-Jun-09
				4.6		5.5	9-Jul-09
				9		19	10-Aug-09
				8		21	8-Sep-09
				5		10	9-Oct-09
				2		6	9-Nov-09
				2		5	8-Dec-09
				1		3	8-Jan-10
				1		3	9-Feb-10
				3		10	8-Mar-10
				1		4	8-Apr-10
				0.4		<QL	7-May-10
				1		3	8-Jun-10
				8.9		6.1	8-Jul-09
				3		5	6-Aug-10
				1		3	7-Sep-10
				1		5	8-Oct-10
				1		5	4-Nov-10
				<QL		<QL	8-Dec-10
				1		5	6-Jan-11
				4		2	9-Feb-11
				2		1	8-Mar-11
				2		3	8-Apr-11
				4		8	6-May-11
				1		5	8-Jun-11
				<QL		<QL	8-Jul-11
				0.5		2	9-Aug-11
				2		3	8-Sep-11
				2		1	6-Oct-11
				1		3	7-Nov-11
				<QL		<QL	6-Dec-11
				<QL		<QL	5-Jan-12
				1		3	9-Feb-12
				3		3	7-Mar-12
				<QL		<QL	5-Apr-12
				<QL		<QL	7-May-12
				1		<QL	8-Jun-12
				1		4	3-Jul-12
				3		8	6-Aug-12
				1		2	7-Sep-12
				11		17	9-Oct-12
				13		19	8-Nov-12

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001	DO (mg/L)				7.9		8-Aug-08
					7.8		5-Sep-08
					8		10-Oct-08
					8.1		7-Nov-08
					8.9		8-Dec-08
					9.2		8-Jan-09
					8.9		9-Feb-09
					9.4		10-Mar-09
					9.2		8-Apr-09
					8.8		8-May-09
					8.4		8-Jun-09
					8.1		9-Jul-09
					8		10-Aug-09
					7.8		8-Sep-09
					8		9-Oct-09
					8.4		9-Nov-09
					9		8-Dec-09
					9.1		8-Jan-10
					9.3		9-Feb-10
					10.1		8-Mar-10
					9.5		8-Apr-10
					8.8		7-May-10
					8.3		8-Jun-10
					7.9		8-Jul-09
					7.9		6-Aug-10
					8.1		7-Sep-10
					8.1		8-Oct-10
					8.3		4-Nov-10
					8.4		8-Dec-10
					7.8		6-Jan-11
					9.3		9-Feb-11
					9.2		8-Mar-11
					9.6		8-Apr-11
					7.8		6-May-11
					8.5		8-Jun-11
					8.1		8-Jul-11
					7.8		9-Aug-11
					7.9		8-Sep-11
					7.9		6-Oct-11
					8.5		7-Nov-11
					7.9		6-Dec-11
					8.1		5-Jan-12
					9		9-Feb-12
					8.4		7-Mar-12
					8.4		5-Apr-12
					8.4		7-May-12
					8.3		8-Jun-12
					8.1		3-Jul-12
					7.9		6-Aug-12
					8.1		7-Sep-12
					8.1		9-Oct-12
					8.4		8-Nov-12
				3 yr. Min:	*7.8*		
				3 yr. Avg:	*8.45135*		
				Limit	*5.9*		
				Ratio x100	*69.8113*		

Reduced Monitoring? *Based on data, eligible for reduction from baseline 7 to 5 per week; however, per GM10-2003, reduced monitoring can only be applied where post-aeration is passive rather than active; therefore, this facility is not eligible.*

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall 001	Parameter	Quant Avg *(kg/d)*	Quanti Max	Conc Avg (mg/L)	Conc Min	Conc Max	Received Date
	PHOSPHORUS, TOTAL (AS P)	38.1		1.43			8-Aug-08
		33.2		1.38			5-Sep-08
		48.3		1.53			10-Oct-08
		27.6		1.07			7-Nov-08
		24.3		0.91			8-Dec-08
		19.8		0.60			8-Jan-09
		21.8		0.75			9-Feb-09
		17.9		0.66			10-Mar-09
		19.7		0.55			8-Apr-09
		27.7		0.84			8-May-09
		34.2		1.09			8-Jun-09
		34.6		1.30			9-Jul-09
		33.2		1.30			10-Aug-09
		31.1		1.26			8-Sep-09
		31.5		1.21			9-Oct-09
		26.6		1.13			9-Nov-09
		24.9		0.64			8-Dec-09
		20.8		0.39			8-Jan-10
		26.8		0.69			9-Feb-10
		32.4		0.67			8-Mar-10
		31.8		0.79			8-Apr-10
		31.6		0.96			7-May-10
		30.8		1.12			8-Jun-10
		34.3		1.42			8-Jul-09
		32.8		1.47			6-Aug-10
		34.9		1.48			7-Sep-10
		26.9		1.26			8-Oct-10
		22.1		0.94			4-Nov-10
		23.4		1.05			8-Dec-10
		45.0		1.31			6-Jan-11
		18.7		0.57			9-Feb-11
		21.2		0.64			8-Mar-11
		24.2		0.69			8-Apr-11
		13.3		0.37			6-May-11
		10.9		0.28			8-Jun-11
		21.0		0.70			8-Jul-11
		36.8		0.98			9-Aug-11
		10.9		0.35			8-Sep-11
		8.9		0.24			6-Oct-11
		4.9		0.15			7-Nov-11
		9.5		0.26			6-Dec-11
		10.9		0.29			5-Jan-12
		11.5		0.34			9-Feb-12
		24.5		0.70			7-Mar-12
		17.0		0.42			5-Apr-12
		19.4		0.54			7-May-12
		19.9		0.64			8-Jun-12
		27.4		0.76			3-Jul-12
		27.7		0.91			6-Aug-12
		23		0.81			7-Sep-12
		25		0.83			9-Oct-12
		19		0.68			8-Nov-12

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall 001	Parameter	Quant Avg (kg/d)	Quanti Max (kg/d)	Conc Avg (mg/L)	Conc Min	Conc Max (mg/L)	Received Date
	AMMONIA, AS N NOV-MAY (mg/L)						
		<QL	<QL	<QL		<QL	8-Dec-08
		<QL	<QL	<QL		<QL	8-Jan-09
		<QL	<QL	<QL		<QL	9-Feb-09
		<QL	<QL	<QL		<QL	10-Mar-09
		<QL	<QL	<QL		<QL	8-Apr-09
		<QL	<QL	<QL		<QL	8-May-09
		<QL	<QL	<QL		<QL	8-Jun-09
		1.4	<QL	0.04		<QL	8-Dec-09
		8.9	7.7	0.17		0.16	8-Jan-10
		11	24.3	0.29		0.72	9-Feb-10
		7.9	18.3	0.16		0.4	8-Mar-10
		4.9	13	0.12		0.28	8-Apr-10
		0.9	3.6	0.03		0.12	7-May-10
		<QL	<QL	<QL		<QL	8-Jun-10
		<QL	<QL	<QL		<QL	8-Dec-10
		89.7	80.3	2.49		2.17	6-Jan-11
		194.2	321.8	5.77		9.2	9-Feb-11
		177.6	244.9	5.06		6.42	8-Mar-11
		55.3	55.6	1.5		1.46	8-Apr-11
		<QL	<QL	<QL		<QL	6-May-11
		<QL	<QL	<QL		<QL	8-Jun-11
		<QL	<QL	<QL		<QL	6-Dec-11
		<QL	<QL	<QL		<QL	5-Jan-12
		3.2	16	0.07		0.37	9-Feb-12
		<QL	<QL	<QL		<QL	7-Mar-12
		<QL	<QL	<QL		<QL	5-Apr-12
		<QL	<QL	<QL		<QL	7-May-12
		<QL	<QL	<QL		<QL	8-Jun-12
	3 yr. Average:	*50.45*	*78.55*	*1.43*		*2.13*	
	Limit	*581.00*	*872.00*	*12.80*		*19.20*	
	Ratio x100	*8.68*	*9.01*	*11.15*		*11.09*	
	Reduced Monitoring?	*Reduced from baseline 7 per week to 1 per week due to E3 VEEP Participation.*					
	CBOD5, NOV-MAY						
		<QL	<QL	<QL		<QL	8-Dec-08
		<QL	<QL	<QL		<QL	8-Jan-09
		<QL	<QL	<QL		<QL	9-Feb-09
		<QL	<QL	<QL		<QL	10-Mar-09
		<QL	<QL	<QL		<QL	8-Apr-09
		<QL	<QL	<QL		<QL	8-May-09
		<QL	<QL	<QL		<QL	8-Jun-09
		<QL	<QL	<QL		<QL	8-Dec-09
		<QL	<QL	<QL		<QL	8-Jan-10
		<QL	<QL	<QL		<QL	9-Feb-10
		<QL	<QL	<QL		<QL	8-Mar-10
		<QL	<QL	<QL		<QL	8-Apr-10
		<QL	<QL	<QL		<QL	7-May-10
		<QL	<QL	<QL		<QL	8-Jun-10
		<QL	<QL	<QL		<QL	8-Dec-10
		19.7	<QL	0.6		<QL	6-Jan-11
		26.7	106.8	0.7		2.8	9-Feb-11
		<QL	<QL	<QL		<QL	8-Mar-11
		81.3	105.6	2.3		2.8	8-Apr-11
		<QL	<QL	<QL		<QL	6-May-11
		84.4	337.6	2.3		9.1	8-Jun-11
		<QL	<QL	<QL		<QL	6-Dec-11
		<QL	<QL	<QL		<QL	5-Jan-12
		<QL	<QL	<QL		<QL	9-Feb-12
		56.4	225.7	1.3		5	7-Mar-12
		<QL	<QL	<QL		<QL	5-Apr-12
		<QL	<QL	<QL		<QL	7-May-12
		<QL	<QL	<QL		<QL	8-Jun-12
	3 yr. Average:	*53.70*	*193.93*	*1.44*		*4.93*	
	Limit	*917.00*	*1376.00*	*20.00*		*30.00*	
	Ratio x100	*5.86*	*14.09*	*7.20*		*16.42*	
	Reduced Monitoring?	*Reduced from baseline 7 per week to 1 per week due to E3 VEEP Participation.*					

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001	E.COLI (n/100ml)			2			8-Aug-08
				<1			5-Sep-08
				2			10-Oct-08
				4			7-Nov-08
				1			8-Dec-08
				1			8-Jan-09
				1			9-Feb-09
				1			10-Mar-09
				1			8-Apr-09
				<1			8-May-09
				1			8-Jun-09
				1			9-Jul-09
				1			10-Aug-09
				1			8-Sep-09
				2			9-Oct-09
				1			9-Nov-09
				1			8-Dec-09
				2			8-Jan-10
				1			9-Feb-10
				1			8-Mar-10
				2			8-Apr-10
				3			7-May-10
				1			8-Jun-10
				2			8-Jul-09
				<QL			6-Aug-10
				1			7-Sep-10
				1			8-Oct-10
				<QL			4-Nov-10
				2			8-Dec-10
				1			6-Jan-11
				1			9-Feb-11
				1			8-Mar-11
				1			8-Apr-11
				2			6-May-11
				2			8-Jun-11
				1			8-Jul-11
				2			9-Aug-11
				1			8-Sep-11
				1			6-Oct-11
				1			7-Nov-11
				<QL			6-Dec-11
				<QL			5-Jan-12
				2			9-Feb-12
				1			7-Mar-12
				1			5-Apr-12
				2			7-May-12
				1			8-Jun-12
				1			3-Jul-12
				5			6-Aug-12
				<QL			7-Sep-12
				<QL			9-Oct-12
				1			8-Nov-12
			3 yr. Avg:	*1.48*			
			Limit	*126*			
			Ratio x100	*1.18*			

Reduced Monitoring? *Due to proposed modification to chlorine contact tank, not eligible until after 3 years of data are obtained (GM10-2003, section MN-2, page 3).*

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
	CL2, TOTAL						
001	CONTACT (mg/L)				0.7		8-Aug-08
					0.65		5-Sep-08
					0.76		10-Oct-08
					0.65		7-Nov-08
					0.61		8-Dec-08
					0.65		8-Jan-09
					0.82		9-Feb-09
					0.62		10-Mar-09
					0.76		8-Apr-09
					0.65		8-May-09
					0.6		8-Jun-09
					0.62		9-Jul-09
					0.66		10-Aug-09
					0.61		8-Sep-09
					0.76		9-Oct-09
					0.78		9-Nov-09
					0.75		8-Dec-09
					0.61		8-Jan-10
					0.92		9-Feb-10
					0.75		8-Mar-10
					0.78		8-Apr-10
					0.81		7-May-10
					0.65		8-Jun-10
					0.6		8-Jul-09
					0.6		6-Aug-10
					0.6		7-Sep-10
					0.85		8-Oct-10
					0.62		4-Nov-10
					0.67		8-Dec-10
					0.70		6-Jan-11
					0.80		9-Feb-11
					0.61		8-Mar-11
					0.68		8-Apr-11
					0.67		6-May-11
					0.68		8-Jun-11
					0.64		8-Jul-11
					0.69		9-Aug-11
					0.65		8-Sep-11
					0.92		6-Oct-11
					0.60		7-Nov-11
					0.81		6-Dec-11
					1.02		5-Jan-12
					1.02		9-Feb-12
					0.83		7-Mar-12
					0.84		5-Apr-12
					1.00		7-May-12
					0.90		8-Jun-12
					0.78		3-Jul-12
					0.07		6-Aug-12
					0.72		7-Sep-12
					0.69		9-Oct-12
					0.61		8-Nov-12

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001	CL2, INST TECH MIN LIMIT (mg/L)				0.7		8-Aug-08
					0.65		5-Sep-08
					0.76		10-Oct-08
					0.65		7-Nov-08
					0.61		8-Dec-08
					0.65		8-Jan-09
					0.82		9-Feb-09
					0.62		10-Mar-09
					0.76		8-Apr-09
					0.65		8-May-09
					0.6		8-Jun-09
					0.62		9-Jul-09
					0.66		10-Aug-09
					0.61		8-Sep-09
					0.76		9-Oct-09
					0.78		9-Nov-09
					0.75		8-Dec-09
					0.61		8-Jan-10
					0.92		9-Feb-10
					0.75		8-Mar-10
					0.78		8-Apr-10
					0.81		7-May-10
					0.65		8-Jun-10
					0.6		8-Jul-09
					0.6		6-Aug-10
					0.6		7-Sep-10
					0.85		8-Oct-10
					0.62		4-Nov-10
					0.67		8-Dec-10
					0.70		6-Jan-11
					0.80		9-Feb-11
					0.61		8-Mar-11
					0.68		8-Apr-11
					0.67		6-May-11
					0.68		8-Jun-11
					0.64		8-Jul-11
					0.69		9-Aug-11
					0.65		8-Sep-11
					0.92		6-Oct-11
					0.60		7-Nov-11
					0.81		6-Dec-11
					1.02		5-Jan-12
					1.02		9-Feb-12
					0.83		7-Mar-12
					0.84		5-Apr-12
					1.00		7-May-12
					0.90		8-Jun-12
					0.78		3-Jul-12
					0.07		6-Aug-12
					0.72		7-Sep-12
					0.69		9-Oct-12
					0.61		8-Nov-12

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall 001	Parameter	Quant Avg (kg/d)	Quanti Max (kg/d)	Conc Avg (mg/L)	Conc Min	Conc Max (mg/L)	Received Date
	CBOD5, JUN-OCT	<QL	<QL	<QL		<QL	8-Aug-08
		<QL	<QL	<QL		<QL	5-Sep-08
		<QL	<QL	<QL		<QL	10-Oct-08
		<QL	<QL	<QL		<QL	7-Nov-08
		<QL	<QL	<QL		<QL	9-Jul-09
		<QL	<QL	<QL		<QL	10-Aug-09
		<QL	<QL	<QL		<QL	8-Sep-09
		<QL	<QL	<QL		<QL	9-Oct-09
		<QL	<QL	<QL		<QL	9-Nov-09
		<QL	<QL	<QL		<QL	8-Jul-09
		<QL	<QL	<QL		<QL	6-Aug-10
		<QL	<QL	<QL		<QL	7-Sep-10
		<QL	<QL	<QL		<QL	8-Oct-10
		<QL	<QL	<QL		<QL	4-Nov-10
		<QL	<QL	<QL		<QL	8-Jul-11
		<QL	<QL	<QL		<QL	9-Aug-11
		<QL	<QL	<QL		<QL	8-Sep-11
		<QL	<QL	<QL		<QL	6-Oct-11
		<QL	<QL	<QL		<QL	7-Nov-11
		<QL	<QL	<QL		<QL	3-Jul-12
		<QL	<QL	<QL		<QL	6-Aug-12
		<QL	<QL	<QL		<QL	7-Sep-12
		<QL	<QL	<QL		<QL	9-Oct-12
		<QL	<QL	<QL		<QL	8-Nov-12
	Reduced Monitoring?	*Reduced from baseline 7 per week to 1 per week due to E3 VEEP Participation.*					
	TSS, JUN-OCT	42.1	49.1	1.6		1.8	8-Aug-08
		31.1	35.3	1.2		1.4	5-Sep-08
		55.8	99.6	1.8		2.4	10-Oct-08
		47	51.1	1.9		2	7-Nov-08
		56.9	62.8	2.1		2.2	9-Jul-09
		42.9	63.8	1.9		3.3	10-Aug-09
		52.1	70.3	2.1		2.6	8-Sep-09
		55.8	53.1	2.2		2	9-Oct-09
		103.9	132.6	4.3		5.8	9-Nov-09
		58.8	76.9	2.5		3.4	8-Jul-09
		22.2	22.5	1		1	6-Aug-10
		33.6	49	1.3		1.8	7-Sep-10
		27	28	1.1		1.4	8-Oct-10
		36.2	42.9	1.5		1.8	4-Nov-10
		34	59.5	1.1		2	8-Jul-11
		22.2	32.4	1.5		2	9-Aug-11
		52.4	36	1.5		1	8-Sep-11
		130.9	274.5	2.8		5	6-Oct-11
		51.1	61.3	1.4		1.8	7-Nov-11
		31.4	43.9	1.2		1.2	3-Jul-12
		11	43.9	0.3		1	6-Aug-12
		<QL	<QL	<QL		<QL	7-Sep-12
		28	56	1		2	9-Oct-12
		23	29	0.8		1	8-Nov-12
	3 yr. Average:	*44.38*	*65.89*	*1.55*		*2.15*	
	Limit	*611.00*	*917.00*	*13.00*		*20.00*	
	Ratio x100	*7.26*	*7.19*	*11.95*		*10.73*	
	Reduced Monitoring?	*A reduced monitoring frequency of 1/month is aready applied as allowed by the Sampling Schedule Table included in GM10-2003, Section MN-2, page 2.*					

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall 001	Parameter	Quant Avg (kg/d)	Quanti Max (kg/d)	Conc Avg (mg/L)	Conc Min	Conc Max (mg/L)	Received Date
	AMMONIA, AS N JUN-OCT	<QL	<QL	<QL		<QL	8-Aug-08
		<QL	<QL	<QL		<QL	5-Sep-08
		<QL	<QL	<QL		<QL	10-Oct-08
		<QL	<QL	<QL		<QL	7-Nov-08
		<QL	<QL	<QL		<QL	9-Jul-09
		<QL	<QL	<QL		<QL	10-Aug-09
		<QL	<QL	<QL		<QL	8-Sep-09
		<QL	<QL	<QL		<QL	9-Oct-09
		<QL	<QL	<QL		<QL	9-Nov-09
		0.7	<QL	0.03		<QL	8-Jul-09
		<QL	<QL	<QL		<QL	6-Aug-10
		<QL	<QL	<QL		<QL	7-Sep-10
		<QL	<QL	<QL		<QL	8-Oct-10
		3	12	0.14		0.56	4-Nov-10
		<QL	<QL	<QL		<QL	8-Jul-11
		<QL	<QL	<QL		<QL	9-Aug-11
		<QL	<QL	<QL		<QL	8-Sep-11
		<QL	<QL	<QL		<QL	6-Oct-11
		<QL	<QL	<QL		<QL	7-Nov-11
		<QL	<QL	<QL		<QL	3-Jul-12
		<QL	<QL	<QL		<QL	6-Aug-12
		<QL	<QL	<QL		<QL	7-Sep-12
		<QL	<QL	<QL		<QL	9-Oct-12
		<QL	<QL	<QL		<QL	8-Nov-12
	3 yr. Average:	*1.85*	*12.00*	*0.09*		*0.56*	
	Limit	*244.00*	*3676.00*	*5.39*		*8.08*	
	Ratio x100	*0.76*	*0.33*	*1.58*		*6.93*	
	Reduced Monitoring?	*Reduced from baseline 7 per week to 1 per week due to E3 VEEP Participation.*					
	TSS, NOV-MAY	55.9	68.1	2.1		2.4	8-Dec-08
		111.4	148.1	3.2		4	8-Jan-09
		153.1	169	5.2		5.7	9-Feb-09
		102.6	135.1	3.8		4.8	10-Mar-09
		150.1	246.4	3.9		5.2	8-Apr-09
		83.7	105.1	2.5		2.8	8-May-09
		64	92	1.9		2	8-Jun-09
		184.2	219.2	4.6		5.8	8-Dec-09
		235.4	259.5	4.4		4	8-Jan-10
		253.5	364.2	6.3		6.8	9-Feb-10
		303.4	406.6	6.1		6.2	8-Mar-10
		181.8	189.4	4.4		4	8-Apr-10
		138.2	201.7	4		5.2	7-May-10
		70.8	79.2	2.6		3	8-Jun-10
		42.7	45.3	1.9		2	8-Dec-10
		188.2	268.9	5.4		7.2	6-Jan-11
		134.3	361.5	3.9		9.5	9-Feb-11
		115.9	211	3.5		6	8-Mar-11
		69.2	92.1	2		2.4	8-Apr-11
		126.6	185.1	3.5		4.5	6-May-11
		57.4	110.2	1.6		3	8-Jun-11
		145.1	149.4	3.7		4	6-Dec-11
		144.9	176.8	3.6		4.3	5-Jan-12
		131.4	255.1	3.7		5.8	9-Feb-12
		158.6	198.9	4.2		5	7-Mar-12
		152.6	222.8	3.7		4.5	5-Apr-12
		57.2	68.2	1.8		1.9	7-May-12
		32.4	51.1	1.3		1.5	8-Jun-12
	3 yr. Average:	*135.81*	*191.28*	*3.55*		*4.48*	
	Limit	*917.00*	*1376.00*	*20.00*		*30.00*	
	Ratio x100	*14.81*	*13.90*	*17.75*		*14.94*	
	Reduced Monitoring?	*A reduced monitoring frequency of 1/month is aready applied as allowed by the Sampling Schedule Table included in GM10-2003, Section MN-2, page 2.*					

Facility Name:Falling Creek WWTP
Permit No:VA0024996

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Received Date
001	NITROGEN, TOTAL (AS N) (YEAR-TO-DATE) (mg/L)			2.08			10-Feb-12
				3.36			10-Mar-12
				3.49			10-Apr-12
				3.75			10-May-12
				3.94			10-Jun-12
				3.96			10-Jul-12
				3.96			6-Aug-12
				4.08			7-Sep-12
				4.08			9-Oct-12
				4.20			8-Nov-12

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Falling Creek WWTP Permit No.: VA0024996

Receiving Stream: James River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	65	mg/L
90% Temperature (Annual) =	28.8	deg C
90% Temperature (Wet season) =	NA	deg C
90% Maximum pH =	8	SU
10% Maximum pH =	7.2	SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	12	MGD
7Q10 (Annual) =	348	MGD
30Q10 (Annual) =	348	MGD
1Q10 (Wet season) =		MGD
30Q10 (Wet season) =		MGD
30Q5 =	348	MGD
Harmonic Mean =	348	MGD

Mixing Information

Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information

Mean Hardness (as CaCO3) =	108	mg/L
90% Temp (Annual) =	26	deg C
90% Temp (Wet season) =	NA	deg C
90% Maximum pH =	7.59	SU
10% Maximum pH =	7.01	SU
Discharge Flow =	12	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	5	--	--	na	9.9E+02	--	--	na	3.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+04**
Acrolein	0	--	--	na	9.3E+00	--	--	na	2.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.8E+02**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	7.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.5E+01**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	6.0E+00	--	na	1.5E-02	--	--	--	--	--	--	--	--	**6.0E+00**	**--**	**na**	**1.5E-02**
Ammonia-N (mg/l) (Yearly)	0	1.33E+01	1.01E+00	na	--	2.66E+01	3.02E+01	na	--	--	--	--	--	--	--	--	--	**2.66E+01**	**3.02E+01**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	1.73E+01	#VALUE!	na	--	1.73E+01	#VALUE!	na	--	--	--	--	--	--	--	--	--	**1.73E+01**	**#VALUE!**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	1.2E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+06**
Antimony	0	--	--	na	6.4E+02	--	--	na	1.9E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+04**
Arsenic	o	3.4E+02	1.5E+02	na	--	6.8E+02	4.5E+03	na	--	--	--	--	--	--	--	--	--	**6.8E+02**	**4.5E+03**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+04**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	6.0E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.0E-02**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
Bis2-Chloroethyl Ether [C]	0	--	--	na	5.3E+00	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+02**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	2.0E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+06**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	6.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.6E+02**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	4.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+04**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	5.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.7E+04**
Cadmium	0	3.3E+00	8.2E-01	na	--	6.7E+00	2.5E+01	na	--	--	--	--	--	--	--	--	--	**6.7E+00**	**2.5E+01**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	4.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+02**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	4.8E+00	1.3E-01	na	2.4E-01	--	--	--	--	--	--	--	--	**4.8E+00**	**1.3E-01**	**na**	**2.4E-01**
Chloride	0	8.6E+05	2.3E+05	na	--	1.7E+06	6.9E+06	na	--	--	--	--	--	--	--	--	--	**1.7E+06**	**6.9E+06**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	3.8E+01	3.3E+02	na	--	--	--	--	--	--	--	--	--	**3.8E+01**	**3.3E+02**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	4.8E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+04**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	3.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.9E+03**
Chloroform	0	--	--	na	1.1E+04	--	--	na	3.3E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+05**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	4.8E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+04**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	4.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.5E+03**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	1.7E-01	1.2E+00	na	--	--	--	--	--	--	--	--	--	**1.7E-01**	**1.2E+00**	**na**	**--**
Chromium III	0	5.1E+02	5.3E+01	na	--	1.0E+03	1.6E+03	na	--	--	--	--	--	--	--	--	--	**1.0E+03**	**1.6E+03**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	3.2E+01	3.3E+02	na	--	--	--	--	--	--	--	--	--	**3.2E+01**	**3.3E+02**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	5.4E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E-01**
Copper	0	1.2E+01	6.3E+00	na	--	2.3E+01	1.9E+02	na	--	--	--	--	--	--	--	--	--	**2.3E+01**	**1.9E+02**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	4.4E+01	1.6E+02	na	4.8E+05	--	--	--	--	--	--	--	--	**4.4E+01**	**1.6E+02**	**na**	**4.8E+05**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	9.3E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.3E-02**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	6.6E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.6E-02**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	2.2E+00	3.0E-02	na	6.6E-02	--	--	--	--	--	--	--	--	**2.2E+00**	**3.0E-02**	**na**	**6.6E-02**
Demeton	0	--	1.0E-01	na	--	--	3.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**3.0E+00**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	3.4E-01	5.1E+00	na	--	--	--	--	--	--	--	--	--	**3.4E-01**	**5.1E+00**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	3.9E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.9E+04**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+04**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	5.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.7E+03**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	8.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.4E+00**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	5.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.1E+03**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+04**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	2.1E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+05**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	3.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+05**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	8.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.7E+03**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	4.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.5E+03**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	6.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.3E+03**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	4.8E-01	1.7E+00	na	1.6E-02	--	--	--	--	--	--	--	--	**4.8E-01**	**1.7E+00**	**na**	**1.6E-02**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	1.3E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+06**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	2.6E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+04**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	3.3E+07	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+07**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	1.4E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+05**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	1.6E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+05**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	8.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.4E+03**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	1.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.0E+03**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	1.5E-06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E-06**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	6.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.0E+01**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	4.4E-01	1.7E+00	na	2.7E+03	--	--	--	--	--	--	--	--	**4.4E-01**	**1.7E+00**	**na**	**2.7E+03**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	4.4E-01	1.7E+00	na	2.7E+03	--	--	--	--	--	--	--	--	**4.4E-01**	**1.7E+00**	**na**	**2.7E+03**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	4.4E-01	1.7E+00	--	--	--	--	--	--	--	--	--	--	**4.4E-01**	**1.7E+00**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	2.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+03**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	1.7E-01	1.1E+00	na	1.8E+00	--	--	--	--	--	--	--	--	**1.7E-01**	**1.1E+00**	**na**	**1.8E+00**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.0E+00**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	6.3E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.3E+04**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	4.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+03**
Fluorene	0	--	--	na	5.3E+03	--	--	na	1.6E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+05**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	3.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**3.0E-01**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	1.0E+00	1.1E-01	na	2.4E-02	--	--	--	--	--	--	--	--	**1.0E+00**	**1.1E-01**	**na**	**2.4E-02**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	1.0E+00	1.1E-01	na	1.2E-02	--	--	--	--	--	--	--	--	**1.0E+00**	**1.1E-01**	**na**	**1.2E-02**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	8.7E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.7E-02**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	5.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+03**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.5E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+00**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	5.1E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.1E+00**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.9E+00	--	na	5.4E+01	--	--	--	--	--	--	--	--	**1.9E+00**	**--**	**na**	**5.4E+01**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	3.3E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+04**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.9E+02**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	6.0E+01	na	--	--	--	--	--	--	--	--	--	**--**	**6.0E+01**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	2.9E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+05**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	9.9E+01	8.0E+00	na	--	2.0E+02	2.4E+02	na	--	--	--	--	--	--	--	--	--	**2.0E+02**	**2.4E+02**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	3.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**3.0E+00**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	2.8E+00	2.3E+01	- -	- -	--	--	--	--	--	--	--	--	**2.8E+00**	**2.3E+01**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	4.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.5E+04**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.8E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+05**
Methoxychlor	0	--	3.0E-02	na	--	--	9.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**9.0E-01**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.6E+02	1.4E+01	na	4.6E+03	3.2E+02	4.3E+02	na	1.4E+05	--	--	--	--	--	--	--	--	**3.2E+02**	**4.3E+02**	**na**	**1.4E+05**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+04**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	9.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.0E+02**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.8E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+03**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+02**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	5.6E+01	2.0E+02	na	--	--	--	--	--	--	--	--	--	**5.6E+01**	**2.0E+02**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	1.3E-01	3.9E-01	na	--	--	--	--	--	--	--	--	--	**1.3E-01**	**3.9E-01**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	4.2E-01	na	1.9E-02	--	--	--	--	--	--	--	--	**--**	**4.2E-01**	**na**	**1.9E-02**
Pentachlorophenol [C]	0	9.6E+00	8.1E+00	na	3.0E+01	1.9E+01	2.4E+02	na	9.0E+02	--	--	--	--	--	--	--	--	**1.9E+01**	**2.4E+02**	**na**	**9.0E+02**
Phenol	0	--	--	na	8.6E+05	--	--	na	2.6E+07	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+07**
Pyrene	0	--	--	na	4.0E+03	--	--	na	1.2E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+05**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	4.0E+01	1.5E+02	na	1.3E+05	--	--	--	--	--	--	--	--	**4.0E+01**	**1.5E+02**	**na**	**1.3E+05**
Silver	0	2.7E+00	--	na	--	5.4E+00	--	na	--	--	--	--	--	--	--	--	--	**5.4E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	1.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+03**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.9E+02**
Thallium	0	--	--	na	4.7E-01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Toluene	0	--	--	na	6.0E+03	--	--	na	1.8E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	1.5E+00	6.0E-03	na	8.4E-02	--	--	--	--	--	--	--	--	**1.5E+00**	**6.0E-03**	**na**	**8.4E-02**
Tributyltin	0	4.6E-01	7.2E-02	na	--	9.2E-01	2.2E+00	na	--	--	--	--	--	--	--	--	--	**9.2E-01**	**2.2E+00**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+03**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	4.8E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	9.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.0E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	7.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.2E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	7.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.2E+02**
Zinc	0	1.0E+02	8.4E+01	na	2.6E+04	2.1E+02	2.5E+03	na	7.8E+05	--	--	--	--	--	--	--	--	**2.1E+02**	**2.5E+03**	**na**	**7.8E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	1.9E+04
Arsenic	2.7E+02
Barium	na
Cadmium	2.7E+00
Chromium III	4.0E+02
Chromium VI	1.3E+01
Copper	9.4E+00
Iron	na
Lead	7.9E+01
Manganese	na
Mercury	1.1E+00
Nickel	1.3E+02
Selenium	1.6E+01
Silver	2.2E+00
Zinc	8.3E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

MSTRANTI DATA SOURCE REPORT – Outfall 001

Stream information	
Mean Hardness	Stream information obtained from DEQ water quality monitoring data at station 2-JMS104.16, approximately one mile upstream of facility.
90% Temperature (annual)	
90% Temperature (wet season)	
90% Maximum pH	
10% Maximum pH	
Tier Designation	Tier Determination (Item 14 in Fact Sheet)
Stream Flows	
All Data	Because stream flows are tidal; flows represented in MSTRANTI reflect effluent design flow multiplied by the acute and chronic mixing ratio, as appropriate.
Mixing Information	
All Data	Acute default mix ratio as recommended by GM00-2011 for tidal waters; chronic mix ratio identified in 1992 mixing study (Attachment E).
Effluent Information	
Mean Hardness	Hardness data as presented in the Water Quality Criteria Monitoring data provided in the 2012 permit application.
90% Temperature (annual)	Maximum daily temperature provided in 2012 permit application Form 2A. This is best available estimate of 90% temperature.
90% Maximum pH	Effluent Data from DMRs.
10% Maximum pH	Effluent Data from DMRs.
Discharge flow	Design flow proposed in 2012 permit application.

Data Location:

Effluent Data – Attachment F

Flow Frequency Memo – Attachment A

STATS.EXE printouts

```
Chemical  = Ammonia
              Chronic averaging period =  30
              WLAa    =  26.6
              WLAc    =  30.2
              Q.L.      = 1
              # samples/mo. = 4
              # samples/wk. = 1

              Summary of Statistics:

              # observations = 1
              Expected Value =  9
              Variance       =  29.16
              C.V.           = 0.6
              97th percentile daily values  =  21.9007
              97th percentile 4 day average =  14.9741
              97th percentile 30 day average=  10.8544
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

               No Limit is required for this material

              The data are:   9

Chemical  = Chloride
              Chronic averaging period =  4
              WLAa    =  1700
              WLAc    =  6900
              Q.L.      = 1
              # samples/mo. = 1
              # samples/wk. = 1

              Summary of Statistics:

              # observations = 1
              Expected Value =  51
              Variance       =  936.36
              C.V.           = 0.6
              97th percentile daily values  =  124.104
              97th percentile 4 day average =  84.8532
              97th percentile 30 day average=  61.5087
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

               No Limit is required for this material

              The data are:  51
```

STATS.EXE printouts

```
Chemical  = Copper
              Chronic averaging period =  4
              WLAa    =  23
              WLAc    =  190
              Q.L.      = 1
              # samples/mo. = 1
              # samples/wk. = 1

              Summary of Statistics:

              # observations = 1
              Expected Value =  3.5
              Variance       =  4.41
              C.V.           = 0.6
              97th percentile daily values  =  8.51696
              97th percentile 4 day average =  5.82326
              97th percentile 30 day average=  4.22118
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

               No Limit is required for this material

              The data are: 3.5

Chemical  = Lead
              Chronic averaging period =  4
              WLAa    =  200
              WLAc    =  240
              Q.L.      = 0.1
              # samples/mo. = 1
              # samples/wk. = 1

              Summary of Statistics:

              # observations = 1
              Expected Value =  .19
              Variance       =  .012996
              C.V.           = 0.6
              97th percentile daily values  =  .462349
              97th percentile 4 day average =  .316120
              97th percentile 30 day average=  .229150
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

               No Limit is required for this material

              The data are:  0.19
```

STATS.EXE printouts

```
Chemical  = Nickel
              Chronic averaging period =  4
              WLAa    =  320
              WLAc    =  430
              Q.L.      = 0.1
              # samples/mo. = 1
              # samples/wk. = 1

              Summary of Statistics:

              # observations = 1
              Expected Value =  1.8
              Variance       =  1.1664
              C.V.           = 0.6
              97th percentile daily values  =  4.38015
              97th percentile 4 day average =  2.99482
              97th percentile 30 day average=  2.17089
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

               No Limit is required for this material

              The data are:   1.8

Chemical  = TRC
              Chronic averaging period =  4
              WLAa    =  38
              WLAc    =  330
              Q.L.      = 1
              # samples/mo. = 30
              # samples/wk. = 7

              Summary of Statistics:

              # observations = 1
              Expected Value =  20000
              Variance       =  1440000
              C.V.           = 0.6
              97th percentile daily values  =  48668.3
              97th percentile 4 day average =  33275.8
              97th percentile 30 day average=  24121.0
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

              A limit is needed based on Acute Toxicity
              Maximum Daily Limit   = 38
              Average Weekly limit  = 23.2068738565771
              Average Monthly LImit = 18.8336042269718

              The data are: 20000
```

STATS.EXE printouts

```
Chemical  = Zinc
              Chronic averaging period =  4
              WLAa    =  210
              WLAc    =  2500
              Q.L.      = 1
              # samples/mo. = 1
              # samples/wk. = 1

              Summary of Statistics:

              # observations = 1
              Expected Value =  35.1
              Variance       =  443.523
              C.V.           = 0.6
              97th percentile daily values  =  85.4129
              97th percentile 4 day average =  58.3990
              97th percentile 30 day average=  42.3324
              # < Q.L.       =  0
              Model used     = BPJ Assumptions, type 2 data

               No Limit is required for this material

              The data are: 35.1
```

Grindall Creek Flow Analysis

Year	Annual Mean Flow (cfs) USGS 0203800 Falling Creek
1956	29
1957	37.8
1958	54.4
1959	27.3
1960	47.2
1961	39.9
1962	55
1963	24.3
1964	20.9
1965	19.4
1966	11.4
1967	19.5
1968	14
1969	18.3
1970	20
1971	24.2
1972	47.1
1973	46.3
1974	31.6
1975	46.7
1976	28.2
1977	20.8
1978	52.9
1979	80.8
1980	66.3
1981	14.2
1982	23.4
1983	34.1
1984	50.2
1985	14
1986	29.3
1987	34
1988	16
1989	30.5
1990	24.9
1991	17.7
1992	22
1993	43.2
1994	41.8
Mean Flow (cfs)	**32.78**
Mean Flow (MGD)	**21.19**

FC Drainage area (square miles)	**33.1**
GC Drainage area (square miles)	**2.17**
GC to FC ratio:	**0.07**
Grindall Creek Mean Flow (cfs):	**2.15**
Grindall Creek Mean Flow (MGD):	**1.39**

Mixing Zone Predictions for Falling Creek WWTP

Effluent Flow = 0.25 MGD
Stream 7Q10 = 1.4 MGD
Stream 30Q10 = 1.4 MGD
Stream 1Q10 = 1.4 MGD
Stream slope = 0.00038 ft/ft
Stream width = 10 ft
Bottom scale = 2
Channel scale = 1

Mixing Zone Predictions @ 7Q10

Depth = .8629 ft
Length = 133.52 ft
Velocity = .296 ft/sec
Residence Time = .0052 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .8629 ft
Length = 133.52 ft
Velocity = .296 ft/sec
Residence Time = .0052 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .8629 ft
Length = 133.52 ft
Velocity = .296 ft/sec
Residence Time = .1253 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

Virginia DEQ Mixing Zone Analysis Version 2.1

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Falling Creek WWTP Outfall 003 Permit No.: VA0024996

Receiving Stream: James River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information			Stream Flows			Mixing Information			Effluent Information		
Mean Hardness (as CaCO3) =	65	mg/L	1Q10 (Annual) =	1.4	MGD	Annual - 1Q10 Mix =	100	%	Mean Hardness (as CaCO3) =	108	mg/L
90% Temperature (Annual) =	28.8	deg C	7Q10 (Annual) =	1.4	MGD	- 7Q10 Mix =	100	%	90% Temp (Annual) =	26	deg C
90% Temperature (Wet season) =	NA	deg C	30Q10 (Annual) =	1.4	MGD	- 30Q10 Mix =	100	%	90% Temp (Wet season) =	NA	deg C
90% Maximum pH =	8	SU	1Q10 (Wet season) =		MGD	Wet Season - 1Q10 Mix =	100	%	90% Maximum pH =	7.59	SU
10% Maximum pH =	7.2	SU	30Q10 (Wet season) =		MGD	- 30Q10 Mix =	100	%	10% Maximum pH =	7.01	SU
Tier Designation (1 or 2) =	1		30Q5 =	1.4	MGD				Discharge Flow =	0.5	MGD
Public Water Supply (PWS) Y/N? =	n		Harmonic Mean =	1.4	MGD						
Trout Present Y/N? =	n										
Early Life Stages Present Y/N? =	y										

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	5	--	--	na	9.9E+02	--	--	na	3.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.7E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	3.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.5E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	9.5E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.5E+00**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	1.1E+01	--	na	1.9E-03	--	--	--	--	--	--	--	--	**1.1E+01**	**--**	**na**	**1.9E-03**
Ammonia-N (mg/l) (Yearly)	0	1.11E+01	1.25E+00	na	--	4.22E+01	4.74E+00	na	--	--	--	--	--	--	--	--	--	**4.22E+01**	**4.74E+00**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	1.73E+01	#VALUE!	na	--	1.73E+01	#VALUE!	na	--	--	--	--	--	--	--	--	--	**1.73E+01**	**#VALUE!**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	1.5E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+05**
Antimony	0	--	--	na	6.4E+02	--	--	na	2.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+03**
Arsenic	o	3.4E+02	1.5E+02	na	--	1.3E+03	5.7E+02	na	--	--	--	--	--	--	--	--	--	**1.3E+03**	**5.7E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	7.6E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.6E-03**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	6.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	6.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	6.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	6.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-01**
Bis2-Chloroethyl Ether [C]	0	--	--	na	5.3E+00	--	--	na	2.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	2.5E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.5E+05**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	8.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.4E+01**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.3E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	7.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.2E+03**
Cadmium	0	2.9E+00	9.2E-01	na	--	1.1E+01	3.5E+00	na	--	--	--	--	--	--	--	--	--	**1.1E+01**	**3.5E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	6.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	9.1E+00	1.6E-02	na	3.1E-02	--	--	--	--	--	--	--	--	**9.1E+00**	**1.6E-02**	**na**	**3.1E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	3.3E+06	8.7E+05	na	--	--	--	--	--	--	--	--	--	**3.3E+06**	**8.7E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	7.2E+01	4.2E+01	na	--	--	--	--	--	--	--	--	--	**7.2E+01**	**4.2E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	6.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	4.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	4.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	6.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	5.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.7E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	3.2E-01	1.6E-01	na	--	--	--	--	--	--	--	--	--	**3.2E-01**	**1.6E-01**	**na**	**--**
Chromium III	0	4.6E+02	5.9E+01	na	--	1.7E+03	2.3E+02	na	--	--	--	--	--	--	--	--	--	**1.7E+03**	**2.3E+02**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	6.1E+01	4.2E+01	na	--	--	--	--	--	--	--	--	--	**6.1E+01**	**4.2E+01**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	6.8E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-02**
Copper	0	1.0E+01	7.1E+00	na	--	4.0E+01	2.7E+01	na	--	--	--	--	--	--	--	--	--	**4.0E+01**	**2.7E+01**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	8.4E+01	2.0E+01	na	6.1E+04	--	--	--	--	--	--	--	--	**8.4E+01**	**2.0E+01**	**na**	**6.1E+04**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	1.2E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E-02**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	8.4E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.4E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	4.2E+00	3.8E-03	na	8.4E-03	--	--	--	--	--	--	--	--	**4.2E+00**	**3.8E-03**	**na**	**8.4E-03**
Demeton	0	--	1.0E-01	na	--	--	3.8E-01	na	--	--	--	--	--	--	--	--	--	**--**	**3.8E-01**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	6.5E-01	6.5E-01	na	--	--	--	--	--	--	--	--	--	**6.5E-01**	**6.5E-01**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	6.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	4.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	3.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.6E+03**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	7.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.2E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+00**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	6.5E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.5E+02**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+03**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	2.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+04**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	3.8E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.8E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+03**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	5.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.7E+02**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	8.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+02**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	9.1E-01	2.1E-01	na	2.1E-03	--	--	--	--	--	--	--	--	**9.1E-01**	**2.1E-01**	**na**	**2.1E-03**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	1.7E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+05**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	3.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.2E+03**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	4.2E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+04**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+04**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+03**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+02**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	1.9E-07	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E-07**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	7.6E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.6E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	8.4E-01	2.1E-01	na	3.4E+02	--	--	--	--	--	--	--	--	**8.4E-01**	**2.1E-01**	**na**	**3.4E+02**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	8.4E-01	2.1E-01	na	3.4E+02	--	--	--	--	--	--	--	--	**8.4E-01**	**2.1E-01**	**na**	**3.4E+02**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	8.4E-01	2.1E-01	--	--	--	--	--	--	--	--	--	--	**8.4E-01**	**2.1E-01**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	3.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.4E+02**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	3.3E-01	1.4E-01	na	2.3E-01	--	--	--	--	--	--	--	--	**3.3E-01**	**1.4E-01**	**na**	**2.3E-01**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+00**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	8.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	5.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.3E+02**
Fluorene	0	--	--	na	5.3E+03	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+04**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	3.8E-02	na	--	--	--	--	--	--	--	--	--	**--**	**3.8E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	2.0E+00	1.4E-02	na	3.0E-03	--	--	--	--	--	--	--	--	**2.0E+00**	**1.4E-02**	**na**	**3.0E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	2.0E+00	1.4E-02	na	1.5E-03	--	--	--	--	--	--	--	--	**2.0E+00**	**1.4E-02**	**na**	**1.5E-03**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	1.1E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E-02**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	6.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	6.5E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.5E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	3.6E+00	--	na	6.8E+00	--	--	--	--	--	--	--	--	**3.6E+00**	**--**	**na**	**6.8E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	4.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+03**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+02**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	7.6E+00	na	--	--	--	--	--	--	--	--	--	**--**	**7.6E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	6.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	3.6E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.6E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	8.4E+01	9.6E+00	na	--	3.2E+02	3.6E+01	na	--	--	--	--	--	--	--	--	--	**3.2E+02**	**3.6E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	3.8E-01	na	--	--	--	--	--	--	--	--	--	**--**	**3.8E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	5.3E+00	2.9E+00	- -	- -	--	--	--	--	--	--	--	--	**5.3E+00**	**2.9E+00**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	5.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.7E+03**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	2.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.2E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	1.1E-01	na	--	--	--	--	--	--	--	--	--	**--**	**1.1E-01**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.5E+02	1.6E+01	na	4.6E+03	5.5E+02	6.1E+01	na	1.7E+04	--	--	--	--	--	--	--	--	**5.5E+02**	**6.1E+01**	**na**	**1.7E+04**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+03**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	1.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+02**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	2.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.3E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	1.1E+02	2.5E+01	na	--	--	--	--	--	--	--	--	--	**1.1E+02**	**2.5E+01**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	2.5E-01	4.9E-02	na	--	--	--	--	--	--	--	--	--	**2.5E-01**	**4.9E-02**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	5.3E-02	na	2.4E-03	--	--	--	--	--	--	--	--	**--**	**5.3E-02**	**na**	**2.4E-03**
Pentachlorophenol [C]	0	1.0E+01	7.7E+00	na	3.0E+01	3.8E+01	2.9E+01	na	1.1E+02	--	--	--	--	--	--	--	--	**3.8E+01**	**2.9E+01**	**na**	**1.1E+02**
Phenol	0	--	--	na	8.6E+05	--	--	na	3.3E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+06**
Pyrene	0	--	--	na	4.0E+03	--	--	na	1.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+04**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	7.6E+01	1.9E+01	na	1.6E+04	--	--	--	--	--	--	--	--	**7.6E+01**	**1.9E+01**	**na**	**1.6E+04**
Silver	0	2.2E+00	--	na	--	8.2E+00	--	na	--	--	--	--	--	--	--	--	--	**8.2E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+02**
Thallium	0	--	--	na	4.7E-01	--	--	na	1.8E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+00**
Toluene	0	--	--	na	6.0E+03	--	--	na	2.3E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.3E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	2.8E+00	7.6E-04	na	1.1E-02	--	--	--	--	--	--	--	--	**2.8E+00**	**7.6E-04**	**na**	**1.1E-02**
Tributyltin	0	4.6E-01	7.2E-02	na	--	1.7E+00	2.7E-01	na	--	--	--	--	--	--	--	--	--	**1.7E+00**	**2.7E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	2.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+02**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	6.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.1E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.1E+01**
Zinc	0	9.3E+01	9.4E+01	na	2.6E+04	3.5E+02	3.6E+02	na	9.9E+04	--	--	--	--	--	--	--	--	**3.5E+02**	**3.6E+02**	**na**	**9.9E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	2.4E+03
Arsenic	3.4E+02
Barium	na
Cadmium	2.1E+00
Chromium III	1.4E+02
Chromium VI	2.4E+01
Copper	1.6E+01
Iron	na
Lead	2.2E+01
Manganese	na
Mercury	1.8E+00
Nickel	3.7E+01
Selenium	1.1E+01
Silver	3.3E+00
Zinc	1.4E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

MSTRANTI DATA SOURCE REPORT – Outfall 003

Stream information	
Mean Hardness	Stream information obtained from DEQ water quality monitoring data at station 2-JMS104.16, on James River approximately one mile upstream of facility.
90% Temperature (annual)	
90% Temperature (wet season)	
90% Maximum pH	
10% Maximum pH	
Tier Designation	Tier Determination (Item 14 in Fact Sheet)
Stream Flows	
All Data	Because discharges authorized by this permit are only to occur when stream flow is above average, average stream flow was entered for all values.
Mixing Information	
All Data	100% mix used in accordance with MIX.exe
Effluent Information	
Mean Hardness	Hardness data as presented in the Water Quality Criteria Monitoring data provided in the 2012 permit application for Outfall 001.
90% Temperature (annual)	Maximum daily temperature provided in 2012 permit application Form 2A for Outfall 001. This is best available estimate of 90% temperature.
90% Maximum pH	Effluent Data from DMRs (Outfall 001).
10% Maximum pH	Effluent Data from DMRs (Outfall 001).
Discharge flow	Design flow proposed in 2012 permit application.

Data Location:

Effluent Data – Attachment F

Flow Frequency Memo – Attachment A

Attachment G

Nutrient Limitation Support Documents

Chesterfield County, Virginia
Utilities Department

9840 Government Center Parkway – P.O. Box 608 – Chesterfield, VA 23832-0009
Phone: (804) 748-1291 – Fax: (804) 751-4607 – Internet: chesterfield.gov

ROY E. COVINGTON
Director

April 9, 2008

VIA EMAIL to vekelly@deq.virginia.gov

Mrs. Virginia R. Kelly
Piedmont Regional Office
Department of Environmental Quality
4949-A Cox Road
Glen Allen, Va. 23060 - 6295

RE: Reissuance of VPDES Permit No VA0024996 for falling Creek WWTP

Dear Mrs. Kelly:

In response to your February 26, 2008 memo I have the following comments:

Item 1: Public Notice
Thank you for the change.

Item 2: Contact Tank TRC Reporting
No comments.

Item 3: Minimum DO Limitation
The proposed minimum effluent DO of 6.0 mg/l to meet the various water quality standards is acceptable.

Item 4: Reduced Monitoring after the IFAS Upgrade
Thank you for extending the reduced monitoring frequencies.

Item 5: Total Nitrogen and Total Phosphorous Annual Average Concentration Limitations
The Utilities Department decided to defer the Total Phosphorous removal upgrades until they are needed to meet the waste load allocation, which will be well beyond 2015. As such the department will save several million dollars in O&M chemical costs by postponing these upgrades and not having to meet an annual average concentration of 0.5 mg/L. The Utilities department has also removed this from the WQIF grant negotiations.

I have also attached a memo from RSR & Associates on the total nitrogen removal for the IFAS system. This memo basically states the IFAS system should be able to meet an annual average total nitrogen concentration of 5.8 mg/L annual average.

Please let me know if any additional information is required. Once again thank you for your time and attention on completing the Falling Creek WWTP permit application. It was a pleasure working with you on this process.

Sincerely,

Scott B. Smedley
Plant Manager
Wastewater Treatment Plants

R. STUART ROYER & ASSOCIATES, INC.
CONSULTING ENGINEERS
Founded 1928

April 8, 2008

Mr. Scott Smedley
Superintendent of Wastewater Treatment
Chesterfield County – DPU
Proctors Creek WWTP
1200 Coxendale Rd.
Chester, VA 23836

RE: Chesterfield County, Virginia
FCWWTP DEQ Permit
RSR Project No. 0730

Dear Mr. Smedley:

We offer the following regarding the proposed modifications to the Falling Creek Wastewater Treatment Plant (FCWWTP). The preliminary engineering report (PER) and the associated process nutrient removal alternatives reviewed were based on an annual waste load allocation (WLA) of 153,801 lb/yr at FCWWTP and 411,151 lb/yr at the Proctors Creek waste water treatment plant (PCWWTP). The WLA is based on effluent total nitrogen (TN) concentration of 5.0 mg/l with flows of 10.1 mgd and 27 mgd at FCWWTP and PCWWTP respectively. It is our understanding that the Chesterfield County WLA is a bubble permit that incorporates both Proctors Creek and Falling Creek resulting in a total WLA for the county rather than two separate WLAs (one for each facility). The total TN WLA for Chesterfield County is 564,952 lb/yr.

We note that the ongoing design is based on the WLA. It is not based on an effluent TN concentration. As such the facility is not expected to continuously meet an effluent TN concentration of 5.0 mg/l. We note that we supported the County in their WQIF agreement of 5.0 mg/l that with an exceedence of 0.8 mg/l for an actual effluent TN of 5.8 mg/l annual average. Therefore, while it is not possible to predict future TN concentrations it is our professional opinion that the upgraded facility should meet an effluent TN annual average of 5.8mg/l.

Chesterfield County plans to meet their nutrient load allocation for Falling Creek WWTP and Proctors Creek WWTP through the following mechanisms; 1) a nutrient allocation bubble between the two facilities, 2) Integrated-fixed-film biological nutrient removal upgrades to both facilities, 3) water reuse agreement with Dominion Power and any future water reuse partners.

1100 WELBORNE DRIVE, SUITE 300 • RICHMOND, VIRGINIA 23229 • (804) 740-0181 FAX (804) 740-1053
www.rstuartroyer.com • EMail@rstuartroyer.com

We appreciate the opportunity to comment on the nutrient loading for Falling Creek. If additional information is needed, please let us know.

Yours truly,
R. Stuart Royer & Associates, Inc.

By Roger O. Hart
Roger O. Hart, P. E.

TFT/nca
P:Chesterfield County 0730 BNR\SmedleyS 04 08 08 TFT FCWWTP DEQ Permit

From: Kelly,Virginia [mailto:vekelly@deq.virginia.gov]
Sent: Tuesday, June 17, 2008 5:10 PM
To: [redacted]
Subject: RE: Out of Office AutoReply: Chesterfield STP

Mike,

This facility is bubbled with the Proctor's Creek WWTP facility, and Proctor's Creek is currently offsetting some nutrient load via reuse with Dominion Power Chesterfield (i.e. Dominion is withdrawing treated effluent water for use in various processes at their facility). Additionally, I believe the Proctor's Creek plant plans to install a chemical feed system to help decrease the TP concentration at that plant, thus decreasing the overall TP load from both facilities in order to comply with the bubbled nutrient load.

The TP 2.0 mg/L limit for both the current plant and the upgrade is based on the former Nutrient Enriched Waters (NEW) designation. As the current PER for Falling Creek WWTP does not include any upgrades for TP removal, no additional/more stringent limitation was established in this permit reissuance. It is important to note that the PER was revised April 9, 2008 to remove TP upgrades at Falling Creek. I believe that Attachment N, Permittee Comments to Draft Permit and DEQ Response, may contain additional details; a scanned copy of this attachment has been included.

I've also included a scanned copy of Attachment I, as requested (note that Guidance Memorandum 07-2008 was also included in this attachment, but not included in the scan due to sizing constraints). The PER components in this attachment do not reflect subsequent changes made to the PER as detailed in the County's April 9th letter.

If you have any additional questions, please let me know (hopefully these attachments are helpful)!

Gina

Ricks, Bradford (DEQ)

From: Brockenbrough, Allan (DEQ)
Sent: Friday, April 26, 2013 3:26 PM
To: Ricks, Bradford (DEQ)
Cc: Cunningham, Frederick (DEQ)
Subject: RE: VA0024996 Chesterfield Falling Creek WWTP Draft VPDES Permit

Brad-

I've discussed with Fred and I think we can move forward with the Falling Creek permit. My only comments are as follows....

- The design flow needs to be listed on Outfalls 001 and 003
- The TN limit should be changed to 5.0 mg/l to be consistent with the guidance and with the WQIF agreement. This is the only permit we have that doesn't match the grant agreement.

We'll accept the compliance plan included with George Hayes' email earlier this afternoon as an offset plan to justify inclusion of the 12 MGD design flow in the general permit.

Give me a call with any questions.

Allan

From: Ricks, Bradford (DEQ)
Sent: Monday, April 22, 2013 4:06 PM
To: Brockenbrough, Allan (DEQ)
Subject: VA0024996 Chesterfield Falling Creek WWTP Draft VPDES Permit

Alan,

The draft individual permit associated with VAN040080 is prepared for owner review. I wanted to run it by you in case you had any input regarding how nutrients are being addressed. Please let me know if you intend to review the draft permit, and if so, any comments you have. Docs are here: http://www.deq.virginia.gov/fileshare/wps/VA0024996/

Thanks,

Brad Ricks
Water Permits
DEQ - Piedmont Regional Office
804 527 5129

Attachment H

Whole Effluent Toxicity Evaluation

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road Glen Allen, VA 23060 804/527-5020

SUBJECT: Whole Effluent Toxicity (WET) Test Data Review
TO: Curtis J. Linderman, Water Permit Manager, PRO
FROM: Brad Ricks, PRO
DATE: March 7, 2013
COPIES: Deborah DeBiasi, CO

Facility Name:	Falling Creek WWTP
Number:	VA0024996
Receiving Stream	James River (Lower) – Freshwater tidal
Facility SIC:	4952
Current Outfall Descriptions:	Outfall 001: POTW Discharge Outfall 003: Flood Pump Discharge
Discharge Location Description:	Outfall 001: James River, North Chesterfield, VA Outfall 003: Grindall Creek, North Chesterfield, VA
Effluent Design Flow:	Outfall 001: 12.0 MGD (increase from 2008 permit of 10.1 MGD) Outfall 003: Flood discharge, 12.0 MGD
In-stream Waste Concentration (IWC):	IWC_{acute}: 50%, $IWC_{chronic}$: 3.3%

FACILITY DESCRIPTION AND PERMIT REQUIREMENTS
The permit for the Falling Creek WWTP is in the process of reissuance. The facility is owned and operated by Chesterfield County and is located at 2100 Station Rd. Richmond, VA. The facility discharges treated wastewater (mostly municipal with some industrial contributors) through Outfall 001 to the tidal James River.

The permit was last reissued on June 13, 2008 and required Whole Effluent Toxicity (WET) testing at Outfall 001 with the following requirements:

- 24-hour flow proportioned composite samples;
- Annual chronic toxicity testing using 3-Brood Chronic Static Renewal Survival and Reproduction test using *Ceriodaphnia dubia* and *Pimephales promelas.*
- Chronic NOEC evaluation criteria of 5% equivalent to TU_c of 20.00.
- Reports were to be submitted annually throughout the permit term.

Because the discharge from Outfall 003 is limited to intermittent and unusual flood events, WET testing was not required and is not proposed for the 2013 permit.

DATA SUMMARY
Results from the quarterly monitoring for toxicity at Outfalls 001 are shown in Table 1. All tests were performed in accordance with approved testing techniques. The 2008 - 2010 annual tests (JRR) were performed with the following sample concentrations: 2, 5, 13, 36, and 100%. These tests reported time proportioned sample collection in contrast to the permit requirement of flow proportioned samples. The 2011 - 2012 annual tests (REIC) were performed with the following sample concentrations: 0.3, 1.1, 5.0, 22.4, and 100%. These tests reported flow-proportioned sample collection. It is noted that discharge flow at this facility is generally consistent through a 24-hour period.

Table 1: Annual WET Test Results for Outfall 001
2008 Permit Endpoints = Chronic NOEC 5%; TU_c 20.00
2013 Draft Permit Endpoints = Chronic NOEC 17%; TU_c 5.88

Test Period	Test Date	48 hr. C.d. LC_{50}	Chronic C.d. NOEC % S/R	TU_c C.d.	Chronic Survival C.d. in 100%	48 hr. P.p. LC_{50}	Chronic P.p. NOEC % S/G	TU_c P.p.	Chronic Survival P.p in 100%	Lab
1st Annual	8/25/2008	>100	36/36	2.78	60	>100	100/100	1	97.5	JRR
2nd Annual	7/27/2009	>100	100/100	1	100	>100	100/**13**	**7.69**	92.5	
3rd Annual	7/26/2010	>100	100/100	1	100	>100	100/**5**	**20**	95	
4th Annual	8/2/2011	>100	100/100	1	100	>100	100/100	1	92.5	REIC
5th Annual	8/28/2012	>100	100/100	1	90	>100	100/100	1	90	

C.d. – *Ceriodaphnia dubia*
P.p. – *Pimephales promelas*
S/R – Survival / Reproduction endpoints
S/G – Survival / Growth endpoints
TU_c – Chronic Toxic Units
JRR – James R. Reed & Associates laboratory
REIC - Research Environmental & Industrial Consultants, Inc. laboratory

DISCUSSION AND DATA EVALUATION

The data presented above met or exceeded the evaluation criteria provided in the 2008 permit, which was a Chronic NOEC of 5% equivalent to a TU_c of 20.00.

Because of an increase in permitted effluent discharge flow, a mixing study upon which the previous acute dilution ratio was based is no longer applicable, causing the acute ratio to become significantly more stringent. The toxicity data was analyzed using the agency established WETLIM10.xls spreadsheet and the STATS.exe statistical software to determine if there is a need to adjust or include permit limitations for toxicity. Based on the results from the WETLIM10 evaluation, the following wasteload allocations were used in the STATS.exe evaluation:

- Acute WLA = 6
- Chronic WLA = 30

Using the wasteload allocations calculated in WETLIM10 and the toxicity data reported in toxic units (TU) as shown in the tables above, the STAT.exe program was used to determine if a toxicity limitation may be required (attached). Based on this analysis, STATS.exe indicates that a limitation of 6 TU_{ac} for tests using *Pimephales promelas* should be required. However, it is noted that this limitation is based on acute toxicity, whereas the reporting requirements and input data were in terms of chronic toxicity and excluded acute data. Based on a review of the analytical data provided, there was no acute toxicity observed (100% survival, 1 $TU_{a,}$ and LC_{50} >100%) in the *Pimephales promelas* data provided for all WET monitoring events. To verify that a limit is not required as a result of chronic toxicity, a third STATS.exe printout is provided to compare *Pimephales promelas* test results to the Chronic WLA only.

Based on the results of WET testing during the 2008 permit term, the 2013 permit is drafted to continue annual chronic WET testing. Conditions are modified to match current agency boilerplate for annual chronic toxicity testing of a discharge to freshwater. Proposed language is as follows:

D. Whole Effluent Toxicity (WET) Monitoring Program

1. Biological Monitoring

a. In accordance with the schedule in Part I.D.2 below, the permittee shall conduct chronic toxicity tests annually for the duration of the permit. The permittee shall collect 24-hour flow-proportioned composite samples of final effluent from Outfall 001.

The chronic static renewal tests to use are:

Chronic 3-Brood Static Renewal Survival and Reproduction test using *Ceriodaphnia dubia; and* Chronic 7-Day Static Renewal Survival and Growth Test using *Pimephales promelas.*

These chronic tests shall be conducted in such a manner and at sufficient dilutions (minimum of five dilutions, derived geometrically) to determine the "No Observed Effect Concentration" (NOEC) for survival and reproduction or growth. Results which cannot be quantified (i.e., a "less than" NOEC value) are not acceptable, and a retest will have to be performed. A retest of a non-acceptable test must be performed during the same compliance period as the test it is replacing. Express the test NOEC as TU_c (Chronic Toxic Units), by dividing 100/NOEC for DMR reporting. Report the LC_{50} at 48 hours and the IC_{25} with the NOEC's in the test report.

b. The test dilutions should be able to determine compliance with the:

Chronic NOEC of **17%**, equivalent to a TU_c of **5.88**

The permittee may provide additional samples to address data variability; these data shall be reported and may be included in the evaluation of effluent toxicity. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3

c. The test data will be statistically evaluated for reasonable potential at the conclusion of the test period. The data may be evaluated sooner if requested by the permittee, or if toxicity has been noted. Should evaluation of the data indicate that a limit is needed, a WET limit and compliance schedule will be required and the toxicity tests in Part I.D.1.a may be discontinued.

d. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limits must control the toxicity of the effluent.

2. Reporting Schedule

The permittee shall submit reports with the DMR and supply 1 copy of the toxicity test report for the tests specified in accordance with the following schedule:

Period	Compliance Date	Submittal Date
Annual 1	By 12/31/2014	By 01/10/2015
Annual 2	By 12/31/2015	By 01/10/2016
Annual 3	By 12/31/2016	By 01/10/2017
Annual 4	By 12/31/2017	By 01/10/2018

STATS.exe printouts:

```
Facility  = Falling Creek WWTP
Chemical  = WET Ceriodaphnia dubia
Chronic averaging period =  4
WLAa     =  6
WLAc     =  30
Q.L.       = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:
# observations = 5
Expected Value =  1.356
Variance       =  .661944
C.V.           = 0.6
97th percentile daily values  =  3.29971
97th percentile 4 day average =  2.25609
97th percentile 30 day average=  1.63540
# < Q.L.       =  0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 2.78, 1, 1, 1, 1
```

```
Facility  = Falling Creek WWTP
Chemical  = WET Pimephales promelas
Chronic averaging period =  4
WLAa     =  6
WLAc     =  30
Q.L.       = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:
# observations = 5
Expected Value =  6.138
Variance       =  13.5630
C.V.           = 0.6
97th percentile daily values =  4.9363
97th percentile 4 day average =  10.2123
97th percentile 30 day average=  7.40275
# < Q.L.       =  0
Model used = BPJ Assumptions, type 2 data


A limit is needed based on Acute Toxicity

        Maximum Daily Limit   = 6
        Average Weekly limit  = 6
        Average Monthly LImit = 6

        The data are:  1, 1, 1, 7.69, 20
```

```
Facility  = Falling Creek WWTP
Chemical  = WET Pimephales promelas
Chronic averaging period =  4
WLAa     =
WLAc     =  30
Q.L.       = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

# observations = 5
Expected Value =  6.138
Variance       =  13.5630
C.V.           = 0.6
97th percentile daily values  =  14.9363
97th percentile 4 day average =  10.2123
97th percentile 30 day average=  7.40275
# < Q.L.       =  0
Model used     = BPJ Assumptions, type 2
data

No Limit is required for this material

The data are: 1, 1, 1, 7.69, 20
```

Virginia DEQ
Deborah L. DeBiasi
804-698-4028 dldebiasi@deq.virginia.gov

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE 100% = NOAEC LC_{50} = NA % Use as NA TUa

ACUTE WLAa 0.6

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	6.000000147	TU_c	NOEC =	17 %	Use as	5.88	TU_c
BOTH*	6.000000147	TU_c	NOEC =	17 %	Use as	5.88	TU_c
AML	6.000000147	TU_c	NOEC =	17 %	Use as	5.88	TU_c

Enter data in the cells with blue type:

Entry Date:	03/08/13		
Facility Name:	Falling Creek WWTP		
VPDES Number:	VA0024996		
Outfall Number:	1		
Plant Flow:	12	MGD	
Acute 1Q10:		MGD	100 %
Chronic 7Q10:		MGD	100 %

ACUTE WLAa,c 6
CHRONIC WLAc 30
* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 2.46566808 a limit may result using WLA.EXE

% Flow to be used from MIX.EXE

Difuser /modeling study?
Enter Y/N Y
Acute 2 :1
Chronic 30 :1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

IWC_a	50 %	Plant flow/plant flow + 1Q10	
IWC_c	3.333333333 %	Plant flow/plant flow + 7Q10	
Dilution, acute	2	100/IWCa	
Dilution, chronic	30	100/IWCc	
WLA_a	0.6	Instream criterion (0.3 TUa) X's Dilution, acute	
WLA_c	30	Instream criterion (1.0 TUc) X's Dilution, chronic	
$WLA_{a,c}$	6	ACR X's WLA_a - converts acute WLA to chronic units	
ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)	
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)	
Constants eA	0.4109447	Default = 0.41	
eB	0.6010373	Default = 0.60	
eC	2.4334175	Default = 2.43	
eD	2.4334175	Default = 2.43 (1 samp)	No. of samples: 1

**The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.

$LTA_{a,c}$	2.4656682	WLAa,c X's eA					
LTA_c	18.031119	WLAc X's eB				Rounded NOEC's	%
MDL** with $LTA_{a,c}$	6.000000147	TU_c	NOEC =	16.666666	(Protects from acute/chronic toxicity)	NOEC =	17 %
MDL** with LTA_c	43.87724052	TU_c	NOEC =	2.279086	(Protects from chronic toxicity)	NOEC =	3 %
AML with lowest LTA	6.000000147	TU_c	NOEC =	16.666666	Lowest LTA X's eD	NOEC =	17

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

							Rounded LC50's	%
MDL with $LTA_{a,c}$	0.600000015	TU_a	LC50 =	166.666663	%	Use NOAEC=100%	LC50 = NA	%
MDL with LTA_c	4.387724052	TU_a	LC50 =	22.790859	%		LC50 = 23	

Virginia DEQ
Deborah L. DeBiasi
804-698-4028 dldebiasi@deq.virginia.gov

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA
(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.889296658

eA = 0.410944686

Using the log variance to develop eB
(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.509098225

eB = 0.601037335

Using the log variance to develop eC
(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD
(P. 100, step 4b of TSD)

n = **1** This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data	Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********		**********	
1			1	0
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	
9			9	
10			10	
11			11	
12			12	
13			13	
14			14	
15			15	
16			16	
17			17	
18			18	
19			19	
20			20	
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA NEED DATA
Mean	0	0	Mean	0 0
Variance	0	0.000000	Variance	0 0.000000
CV	0		CV	0

Virginia DEQ
Deborah L. DeBiasi
804-698-4028 dldebiasi@deq.virginia.gov

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Table 1. Result: Vertebrate ACR 0
Table 2. Result: Invertebrate ACR 0
Lowest ACR Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3. ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50,

enter it here: NO DATA %LC_{50}

NO DATA TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	40.6	2.4656681		
Dilution series to use for limit			17	5.8823529
Dilution factor to recommend:	0.6368435		0.4123106	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	63.7	1.57	41.2	2.43
	40.6	2.47	17.0	5.88
	25.8	3.87	7.0	14.27
	16.45	6.08	2.9	34.60
Extra dilutions if needed	10.48	9.55	1.2	83.92
	6.67	14.99	0.5	203.54

Virginia DEQ
Deborah L. DeBiasi
804-698-4028 dldebiasi@deq.virginia.gov

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Attachment I

Response to Owner Comments

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

May 22, 2013

Mr. George Hayes, P.E.
Assistant Director
Chesterfield County Utilities

Delivered via email to HayesG@Chesterfield.gov

Re: Response to Owner Comments
Falling Creek WWTP, VA0024996

Dear Mr. Hayes:

Thank you for your thorough review of the draft VPDES permit for the Falling Creek Wastewater Treatment Plant and comments received by letter dated May 3, 2013 followed by additional comments received by email dated May 6, 2013. Your comments are summarized below with responses from this office provided in italics.

1. The County intends to investigate and potentially challenge the scientific basis for the decision to link the limit for TSS to the $cBOD_5$ load limited by the Richmond Crater Water Quality Management Plan.

Response: *This limitation is based on typical municipal design to treat cBOD5 and TSS to approximately the same level; however, as a BPJ limitation, it is subject to review, particularly if the Fighting Creek facility was not designed to meet TSS at the concentration proposed in the permit. Monitoring data; however, presents a strong case that facility design is able to provide TSS treatment to concentrations significantly more stringent than in the proposed permit.*

2. Request to maintain the TN annual average concentration at 5.8 mg/L.

Response: *The expected performance of the IFAS system is established in Article 5.0 of the WQIF Grant Agreement which states "The Grantee's Facility shall meet a total nitrogen effluent concentration limitation of 5.0 mg/L on an annual average basis, except as provided in paragraph 5.1 and Article VIII of this Agreement." Paragraph 5.1 provides for the suspension of the limit in accordance with Part I.B.15 of the draft VPDES permit. Article VIII provides for monetary assessments for breach of the WQIF Agreement. No assessment must be paid unless the effluent TN concentration exceeds 5.8 mg/L however the relief provided by this provision*

does not change the limitation itself. If the yearly average exceeds 5.8 mg/L then the assessment is made for every tenth of a mg/L above 5.0 mg/L.

The re-rate study documentation provided with your letter does not attempt to establish the capability of the design under annual average conditions. It establishes the capability of the plant under worst case high flow, low temperature conditions. It further establishes a Particulate TKN load based on an assumed percentage of a TSS limitation rather than the wastewater treatment plant design. For these reasons we believe the TN annual average limitation should be written consistent with the limitation established by the WQIF agreement. The change in the proposed permit limit is necessary to ensure consistent application of 9 VAC 25-40-70 among VPDES permittees.

3. Request to include Outfall 002 on the permit cover page. This Outfall was listed on previous permits and identified in the Fact Sheet.

Response: *The permit cover page authorizes the County to discharge via each listed outfall to the listed receiving stream. Authorization to discharge via Outfall 002 is provided by VPDES permit No. VAR051258 in accordance with the conditions and/or limitations provided therein. Because VPDES Permit No. VA0024996 does not authorize the discharge of treated or untreated effluent via Outfall 002, having no effluent limitation or monitoring requirements therein, it is not appropriate to list the outfall as a discharge authorized by this permit. As stated in the Fact Sheet, non-stormwater discharges from Outfall 002 continue to be considered bypasses and shall continue to be addressed as such in Part II, particularly part H: Reports of Unusual or Extraordinary Discharge; and Part U: Bypass.*

4. Remove Part I.A.1.b and I.A.2.b prohibition of visible foam in other than trace amounts so that foam from other sources in the James River is not attributed to this discharge.

Response: *This is standard language included in all VPDES permits including those which discharge to the James River in order to maintain the narrative Water Quality Standard criteria specified in 9VAC25-260-20.A. Enforcement of this condition would only be appropriate when its violation can <u>clearly</u> be attributed to facility effluent.*

5. Revise Part I.A.1 and I.A.2 note (6) from "At least 85% removal for BODs and TSS must be attained for this effluent" to "At least 85% removal for BODs and TSS [f]or the listed Discharge Limitations must be attained for this effluent" because if influent is diluted due to significant rain events, 85% removal may be unattainable.

Response: *40 CFR 133.102 requires 85% removal of BOD5 (or CBOD5), and TSS at municipal facilities; however, because the corresponding limitations included in this permit are more stringent that the secondary treatment requirements specified in this regulation, Section III.A.6.c of the VPDES Permit Manual states that the 85% removal clause may be excluded when there is a more stringent water quality based limit, which would result in at least 85% removal The permit and fact sheet have been revised accordingly.*

6. Request that the calculated Outfall 004 be removed from the permit to avoid confusion and complexity. Request that the 12 MGD design flow be listed in the notes for Outfall 001.

Response: *Outfall 004 is included in this permit as a calculated total of the loads discharged from Outfall 001 and Outfall 003. Although it is our understanding that Outfall 003 was not utilized during the 2008 permit term for a long term discharge resulting from river flood conditions, if the need for a long term discharge from Outfall 003 was to occur, it would not be possible to track facility compliance with the load limitations assessed for this facility as a whole because a portion of these loads would be reported under Outfall 003 for the duration of its discharge. The change made in response to item 9 below should simplify this requirement.*

7. Clarify item I.B.13 to exclude water reuse or side stream nutrient treatment technologies to trigger modification to the existing annual nutrient concentration limits.

Response: *In order to maintain consistency within the VPDES permitting program, we intend to maintain this special condition as drafted. Please be assured that a reuse project would not be considered nutrient treatment technology that would be used to establish an effluent limitation. Reuse can be utilized to establish the level of technology necessary to meet the wasteload allocation. With regard to side stream treatment the particulars of any given upgrade would have to be evaluated to determine whether or not it impacts the technology-based effluent limitations.*

8. Revise item I.B.16.b to match the 2008 permit, reading, "The flood pumps shall only be exercised when Grindall Creek stream flow is above normal" and remove item 16.e.

Response: *It was necessary to quantify this requirement in order to verify that the discharge will maintain all water quality standards in the receiving stream, but provided the County knows what mean stream flow is through the fact sheet, it is not necessary to quantify it in the permit. Item 16.e has been removed and item 16.b is revised to state, "…when Grindall Creek is above mean stream flow."*

9. Add item I.B.16.f, "During flood pump testing, where the discharge is less than 500,000 gallons, the volume and concentration should be included on outfall 001 and will not be considered a separate discharge from Outfall 003."

Response: *Added item 16.e to state, "When Outfall 003 discharges in accordance with items a through d above, effluent data shall be reported under Part I.A.1 (Outfall 001).*

10. Item I.B.17, revise the cBOD5 and ammonia-N sampling frequency after a NOV from "one per day" to "5 days per week" to coincide with County laboratory staffing requirements and to match current Falling Creek and Proctors Creek permits.

Response: *Revised sampling frequency to "5 per week (at least one day apart)".*

11. Item I.C.5.a and I.C.8, revise sentence from "…and at the entrance of the treatment works" to "…or at the entrance of the treatment works" as this appears to be a typo.

Response: *The language provided is the standard, state-wide boilerplate requirement for facilities with an approved pretreatment program. The intention is best described in Part I.C.8*

as plant influent sampling assists the permittee in development and reevaluation of local limits while effluent sampling at the end of industrial user processes is typically collected by the user in accordance with the local program requirements.

12. Item D.1: The Chronic NOEC of 17% equivalent to a TUc of 5.88 may not be based on current (actual) conditions and the County may perform a mixing study to verify this limit, potentially reopening the permit at that time.

Response: *As indicated to County personnel following receipt of the permit application, a mixing study may be performed to more accurately reflect actual conditions upon which permit limitations and conditions are based.*

13. Item I.D.2: Include the missing annual toxicity test report with a compliance date of 12/31/2013 and submittal date of "By 1/10/2014."

Response: *Annual sampling and reporting requirements are typically based on a complete calendar year schedule. The 2013 sampling event was intentionally not included because 2013 will not be a complete calendar year.*

14. Part II.C.1: Verify accuracy of the Piedmont Regional Office address provided.

Response: *The official PRO office is located at 4949-A Cox Rd. This condition is revised to reflect the correct address.*

15. Revise sample requirement for TRC from 1 per 2 hours to 12 per day. Revise I.B.1.a from "…contact tank every two hours by grab sample" to "…contact tank approximately every two hours by grab sample" as the proposed sample requirement does not allow the needed flexibility to effectively maintain and monitor the BNR process and disinfection system. The proposed revision is comparable to the Proctor's Creek permit.

Response: *Both Part I.A and I.B.1 were revised to specify that the sample frequency of 1 per 2 hours is approximate; thereby allowing flexibility while maintaining 12 samples spaced throughout the day.*

Please review these items and provide your concurrence within 3 days of receipt. Feel free to contact me at (804) 527-5129 or by email at bradford.ricks@deq.virginia.gov if you have any questions.

Sincerely,

Brad Ricks
Water Permit Writer

Chesterfield County, Virginia
Utilities Department

9840 Government Center Parkway – P.O. Box 608– Chesterfield, VA 23832-0009
Phone: (804) 748-1291 – Fax: (804) 751-4607 – Internet: chesterfield.gov

Roy E. Covington, P.E.
Director

May 30, 2013

Mr. Brad Ricks
Department of Environmental Quality
4949-C Cox Road
Glen Allen, VA 23060
Sent via email

Re: Review Comments and Requested Revisions
Draft Falling Creek WWTP VPDES Permit No. VA0024996

Dear Mr. Ricks:

Thank you for reviewing our original comments and allowing us the opportunity to provide additional comments to the above-referenced draft permit. We respectfully submit the following additional follow up comments to your May 22, 2013 correspondence. We, along with our engineers, are available to meet with you at your convenience to provide any additional information.

1. **Response accepted**

2. **DEQ Response:**
The expected performance of the IFAS system is established in Article 5.0 of the WQIF Grant Agreement which states "The Grantee's Facility shall meet a total nitrogen effluent Concentration limitation of 5.0 mg/L on an annual average basis, except as provided in paragraph 5.1 and Article VIII of this Agreement." Paragraph 5.1 provides for the suspension of the limit in accordance with Part I.B.15 of the draft VPDES permit. Article VIII provides for monetary assessments for breach of the WQIF Agreement. No assessment must be paid unless the effluent TN concentration exceeds 5.8 mg/L however the relief provided by this provision does not change the limitation itself. If the yearly average exceeds 5.8 mg/L then the assessment is made for every tenth of an mg/L above 5.0 mg/L.

   The re-rate study documentation provided with your letter does not attempt to establish the capability of the design under annual average conditions. It establishes the capability of the plant under worst case high flow, low temperature conditions. It further establishes a particulate TKN load based on an assumed percentage of a TSS limitation rather than the wastewater treatment plant design. For these reasons we believe the TN annual average limitation should be written consistent with the limitation established by the WQIF agreement. The change in the proposed permit limit is necessary to ensure consistent application of 9 VAC 25-40-70 among VPDES permittees.

   Justification for additional review: We have attached the memo from R. Stuart Royer & Associates, Inc that was submitted during the 2008 permit renewal for the Falling Creek Wastewater Treatment Plant. The letter states in part "*....it is our professional opinion that the upgraded facility should meet an effluent TN annual average of 5.8mg/L*". The annual average concentration limit of

5.8mg/L was accepted by DEQ during the review cycle on April 24, 2008. The concentration limit of 5.8mg/L was assigned to the Falling Creek permit knowing that the WQIF agreement was for 5.0mg/L with a 0.8mg/L variance. There have been no changes to the nutrient removal process design or technologies installed since the issuance of the last permit that would warrant a more stringent nutrient concentration limit.

In response to DEQ's most recent comments, it is not reasonable to establish the capabilities of the design under current day annual average conditions as the county continues to grow along with our wastewater flows. Our engineers must take into account the ultimate permitted capacity of the plant in determining the ability of the installed facilities to meet the concentration limits at the ultimate permitted flow due to the no backsliding rules. With our ability to divert a portion of our flows within the collection system to either of our wastewater treatment plants, the Falling Creek Wastewater Treatment Plant could experience high flow conditions for extended periods. The rerate study that was provided with this permit renewal takes into account the performance of the IFAS system at a 12 MGD design flow. The rerate study indicates that if the soluble inert organic TKN, the design NH3-N, the design NOx-N, and the particulate TKN are taken into account the IFAS process is able to perform well with an effluent concentration limit of < 5.6 mg/L. The rerate study provided data that was used to determine this value of 5.6 mg/L for total nitrogen. In addition, we have previously provided correspondence from DEQ technical staff that reviewed this re-rate study and concurred with the study findings which included these concentration limits. We see no valid basis for the modification from the existing permit and we respectfully request that the total nitrogen limit remain at 5.8 mg/L.

The Preliminary Engineering Report (PER) and associated process nutrient removal alternatives reviewed for Falling Creek were based on the bubbled Waste Load Allocation (WLA). The WQIF Grant agreement with the current total nitrogen concentration limit was determined during the PER and prior to the final acceptance of the design for the Falling Creek upgrades. The WQIF Grant allows for variance and as such the WQIF was accepted provided that we would be able to have a concentration limit up to 5.8mg/L with no penalties. If it is now DEQ's position that these limits are required to mirror each other, we respectfully request that the WQIF grants for both Falling Creek and Proctors Creek be modified to total nitrogen concentration limits of the technologies actually installed at the facilities for the permitted capacities. We understand that the monetary penalties associated with exceeding 5.8mg/L would have to be reevaluated and would result in higher monetary penalties for a violation. We believe that the 5.8mg/L total nitrogen concentration is still consistent with the application of 9 VAC 25-40-70 given that we are still in compliance with the WQIF agreement and the intent of the previously approved concentration limits.

3. **Response accepted**

4. **Response accepted**

5. **Response accepted**

6. **Response accepted**

7. **DEQ Response:**
In order to maintain consistency within the VPDES permitting program, we intend to maintain this special condition as drafted. Please be assured that a reuse project would not be considered nutrient treatment technology that would be used to establish an effluent limitation. Reuse can be utilized to

establish the level of technology necessary to meet the wasteload allocation. With regard to side stream treatment the particulars of any given upgrade would have to be evaluated to determine whether or not it impacts the technology-based effluent limitations.

Justification for additional response: We respect the need to maintain consistency within the VPDES permitting program and accept your response, but want to document our position regarding potential future side stream treatment projects. The effluent concentration limits that were established were based on influent flow characteristics and the ability of the IFAS system to accommodate those conditions. We would like to note that any future side stream treatment we would consider would not lower the influent flow characteristics to the Falling Creek WWTP and therefore would not change any of the original design parameter of the IFAS system installed. It is our stance that these technologies should not trigger any additional effluent limitations.

8. **Response accepted**

9. **Response accepted**

10. **Response accepted**

11. **DEQ Response:**
The language provided is the standard, state-wide boilerplate requirement for facilities with an approved pretreatment program. The intention is best described in Part I.C.8 as plant influent sampling assists the permittee in development and reevaluation of local limits while effluent sampling at the end of industrial user processes is typically collected by the user in accordance with the local program requirements.

Justification for additional response: We respectfully disagree with DEQ's response and request that "and" be replaced with "or" as it is written in the current permit for the Falling Creek Wastewater Treatment Plant. We have contacted multiple localities to compare the wording in our permits and they have indicated that this is not a standard, state-wide boilerplate requirement and that their language falls in line with our previous permit's wording. As per 40 CFR 403, the categorical industries always have the option of either sampling at the end of the process or at the end of the pipe using the "Combined Wastestream Formula."

12. **Response accepted**

13. **Response accepted**

14. **Response accepted**

15. **Response accepted**

Thank you for the opportunity to provide the above comments and recommended revisions to the draft permit. After review, if you have any questions please feel free to contact me at 804-318-8372 or Scott Morris at 804-768-7557.

Sincerely,

George B. Hayes, P.E.
Assistant Director, Chesterfield County Utilities
E-Mail: HayesG@chesterfield.gov

cc: Mr. Roy E. Covington, Director of Utilities
Mr. Scott Morris, Acting Plant Manager

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

June 5, 2013

Mr. George Hayes, P.E.
Assistant Director
Chesterfield County Utilities

Delivered via email to HayesG@Chesterfield.gov

Re: Response to Owner Comments (#2)
Falling Creek WWTP, VA0024996

Dear Mr. Hayes:

Thank you for providing further review and comment on the draft VPDES permit for the Falling Creek Wastewater Treatment Plant. Initial comments were received from the County by letter dated May 3, 2013 and email dated May 6, 2013, with follow up comments received May 30, 2013 in response to our May 22, 2013 review of your initial comments. It appears through your May 30 letter that two items remain outstanding for further review and consideration:

1. The County's request to maintain the TN annual average concentration at 5.8 mg/L; and,
2. The County's request to revise Item I.C.5.a and I.C.8 from "…and at the entrance of the treatment works" to "…or at the entrance of the treatment works".

Following further discussion among DEQ staff and management, the office of water permits and the regional office are in agreement that the TN annual average concentration may be carried forward at 5.8 mg/L. The WQIF grant will not be revised.

Further review of pretreatment condition language used at this and other regional offices has identified a wider discrepancy among "boilerplate" language used than initially indicated. At the direction of the DEQ Central Office Pretreatment Program staff, Parts I.C.5.a, I.C.5.c, and I.C.8 have been revised as follows:

5. Inspect and sample all Significant Industrial Users at a minimum of once a year.

   a. Sampling shall include all regulated parameters, and shall be representative of the wastewater discharged. Samples for categorical standards are collected

immediately downstream from pretreatment facilities or immediately downstream from the regulated process if no pretreatment exists.

c. Sampling events shall be scheduled when the SIU will be discharging if the discharge is intermittent. If an SIU has ceased discharging to the POTW during the reporting period, note the reason for it in the inspection, and what other facility is receiving the effluent if it is still being discharged. Provide this documentation to the DEQ regional staff when the audit is performed.

8. Develop local limits or reevaluate local limits using current influent, effluent and sludge monitoring data and submit the data and results of the evaluation to the DEQ Piedmont Regional Office within one year following the effective date of this permit. Samples for local limits shall be collected at the point where the IU connects to the collection system.

Please review these items and provide your concurrence within 3 days of receipt. Feel free to contact me at (804) 527-5129 or by email at bradford.ricks@deq.virginia.gov if you have any questions.

Sincerely,

Brad Ricks
Water Permit Writer